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Book Reviews Abstracts News Notes

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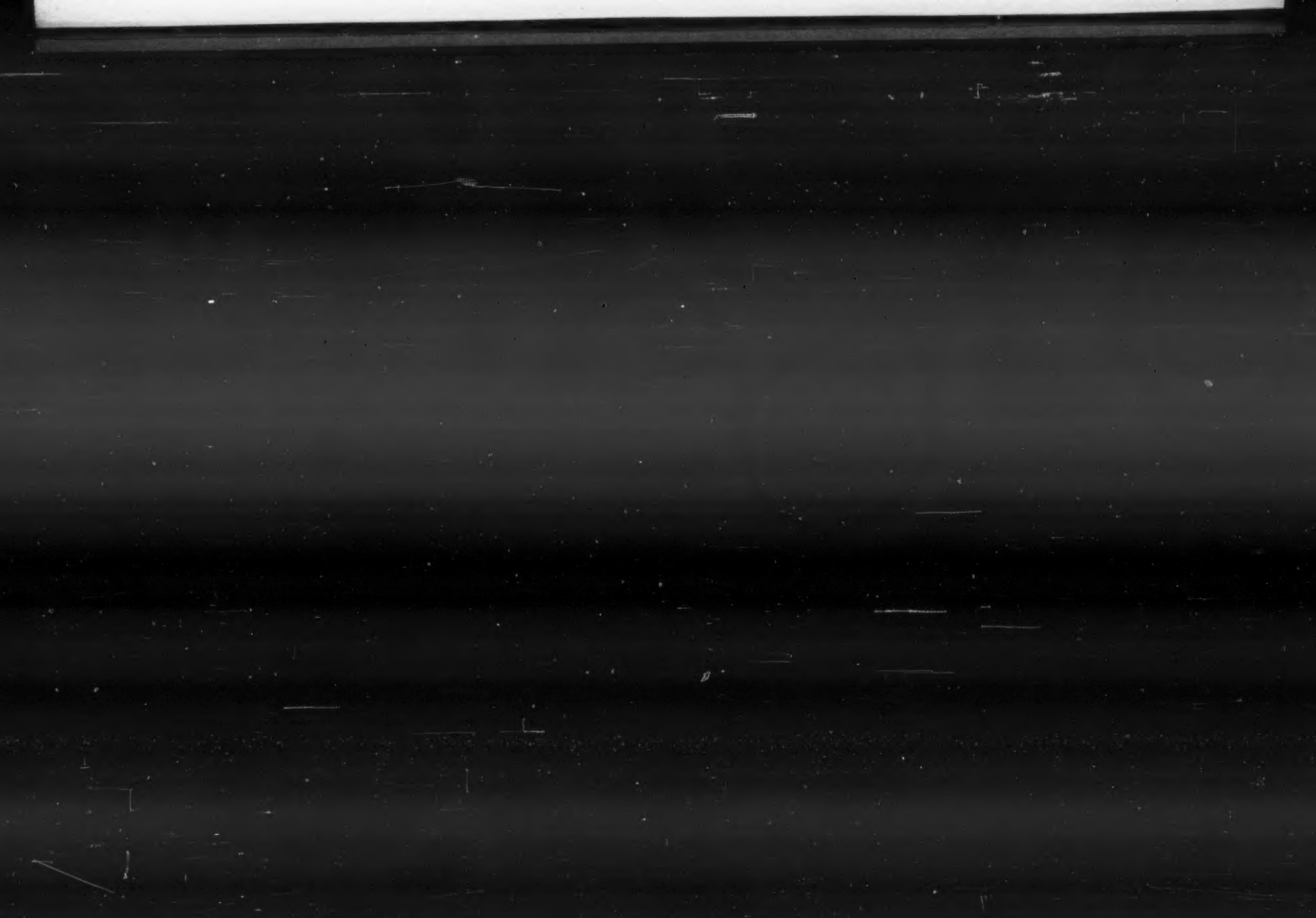

Saving Dollars and Energy by Personnel Research: An Investigation in the Interest of the Postal Service

Part I: Procedure in Effecting Improvements

By L. J. O'Rourke, *United States Civil Service Commission*

Sound and thorough personnel research yields large dividends. The American tax-payer will relish the generous cuts in expense of employing his post office employees, which will result from the work done by the United States Civil Service Commission within the past two years. He will appreciate the wisdom of the Commission in establishing the Research Division of which Dr. O'Rourke is the Director. He will see the value of the improved procedures there developed for examining over 60,000 applicants a year for the positions of post office clerk and city letter carrier; for these tests not only cost 40 per cent less to administer but are securing a more competent group of workers to expedite the accurate handling of the mails.

Large business concerns will not be slow to follow the government in carrying forward similar scientific investigations, to bring about economies in efficient selection of their personnel.

THE annual payroll of the Federal executive civil service amounts to more than $800,000,000. The efficiency of those selected involves billions. Therefore improvements in methods of selection and of performance of duties have far-reaching results. Research is being devoted to the improvement of selective methods and discovery of fundamental principles which not only will be of value in the specific problem under consideration, but may have wide application in personnel work.[1]

The object of the research is conservation, in its broadest sense; conservation by the selection for each kind of position of persons best qualified to render efficient service in that particular work; conservation of ability, of training, and of experience; conservation of energy, where possible, by reducing the amount of effort required to perform the duties; conservation in procedure of selecting employees.

A major problem of the Research Division of the United States Civil

[1] In order that the improvements reported may not be misinterpreted as a contrast with past procedure, I wish to state that ever since the United States Civil Service Commission was created, more than forty-two years ago, improvement of exami-

Service Commission has been the development of means to measure and evaluate factors which are not measured by formal tests of education. These include, so far as possible, studies in interest analysis and personality traits.

SELECTING FEDERAL EMPLOYEES

Although written tests are comparatively new in private industry, for the Civil Service Commission they are more a matter of refinement, since the Commission has never relied on subjective methods to so great an extent as have the industries. In the measuring of aptitudes and abilities, objective methods, that is those which are definite and not dependent on personal judgment, may supplement or be supplemented by qualitative analysis.

It was believed that the most direct progress could be made by (1) analyzing duties and methods of work, (2) developing and improving technique and measurements with a view to improved procedure and economy in administration, (3) developing objective tests of both special aptitudes and general adaptability which would more closely measure the qualifications of applicants for positions, and (4) determining through statistical analysis the degree of validity and the limitations of these measures. Analyzing duties and methods for the purpose of test construction often reveals practical improvements in methods, and basic principles which are of aid in training, in determining most economical procedure, and in conservation of time and energy. These are vital factors in determining cost.

Although governed by fundamental principles, the factors to be measured, as indicated by the analysis, and the practical measurement of these in test form, present for each position an individual problem. For each, the peculiarities of the work, the personnel problem of the organization as a whole, the procedure of transfer and promotion,

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nations has been going on as experience brought out defects or suggested better methods. The need for research was repeatedly pointed out by the Commission, but it was not until July 1, 1922, that an appropriation became available which made possible the establishment of a Research Division.

It was at that time that I became associated with the Civil Service Commission on a special project. During the two months that I was engaged on this work, I was so impressed with the earnestness of the staff and personnel, their desire to give the new and untried a hearing and to translate findings into practice, and the exceptional opportunity presented in such an organization, that I readily accepted the commission to organize and develop the Research Division.

I wish especially to mention the progressive attitude of Mr. Filer, the Chief Examiner, Commissioner Wales, the late Commissioner Helen Gardener, Mr. Yaden, Chief of the Examining Division, Mr. Moffett, then Superintendent of the Field Service, and Commissioner Deming, who has since accepted presidency of the Commission. In such a project as the post office study here reported, progress would be impossible without the coöperation of the department concerned and the good-will of the employees. In this regard, acknowledgment is due especially to the officers of the Post Office Department, as well as to postmasters and employees in Seattle, New York, Washington, D. C., and particularly to the Postmaster, Assistant Postmaster, and employees of the Chicago Post Office.

and the governing policy of the organization are vital considerations.

It seemed best to focus attention where immediate application of results would be possible as in the Postal Service, so that the greatest benefit from the research could be realized.

POST OFFICE PERSONNEL

Of the multitude of employees in the classified civil service of the United States, over 300,000 are occupied in the widespread activities of the Postal Service. During the fiscal year 1924, 25,000 competitors were examined for railway postal clerk positions, and 60,000 for positions as post office clerks and city letter carriers. It is estimated that during the present fiscal year 80,000 will compete in post office clerk and city carrier examinations. One of the research projects undertaken was to determine what improvements could be made in the examinations used as instruments for selecting employees from among these competitors.

The Research Division began its work in connection with Post Office Department examinations in 1922. Marked improvements were made in the examination for selection of railway postal clerks.[2] The data collected during that study were used to advantage in developing the examination for selecting clerks to distribute mail in post offices.

Before a study of measures of qualifications for proficiency in a position is undertaken, the duties and requirements of the position are thoroughly understood. In the usual procedure of the Research Division, the facts first determined are (1) the exact duties of the position under consideration, (2) the processes involved in the performance of those duties, (3) the relative importance of these processes, and (4) the aptitudes and abilities required in order to become proficient in the work.

DUTIES OF A MAIL DISTRIBUTOR

Distributors sort the mail which is to go out on mail trains, and also sort the incoming mail according to the districts of the city. In their work they must memorize complicated distribution schemes involving from 2000 to 5000 names, and separate the mail in accordance with these schemes. In order to become proficient in this work they must not only be able to memorize the schemes, but must be quick and accurate in reading addresses, and must distribute mail without the slightest hesitation as to the compartment into which it is to be thrown. The rapid distributor seldom, if ever, looks at the box into which he throws the mail. When he sees the address on a piece of mail, his hand automatically moves toward the proper box while his eyes focus on the next address.

SAVINGS THROUGH ANALYSIS OF WORKING METHODS

As has been suggested, improvement in method of selection is not the only advantage to be gained from a

[2] One year after employees had been selected by the new examination an investigation was made by the Post Office Department to determine the relative ability of the persons selected by the new examination as compared with those previously selected through the old examination. A marked difference between these groups was found in the time required to memorize complicated distribution schemes, in their aptitude for duties and in their speed and accuracy in performing them.

study of a position. *The analysis of duties, which is necessary in the course of developing special aptitude tests, often reveals methods whereby increased efficiency can be secured with less expenditure of energy.* The work performed by some of the post office distributors presents an example of improvement which analysis may effect. This analysis was made in preparation for the task of devising an examination to measure the aptitudes necessary to become proficient in speed and accuracy in the work of a distributor in a post office.

In the study of the work of distributors, special attention was called to a method of distribution used for second-class mail in one of the large post offices in which the first study was conducted. This method of distribution required a higher degree of skill, greater endurance, and a longer training period than does the usual distribution procedure. Attention was first devoted to determining whether or not it was possible to simplify the process by which this distribution was made. Simplification of the work might materially change the qualifications necessary for success in the position, and much time would have been wasted if methods of measurement of unnecessary qualifications had been developed.

Because the mail handled by these distributors consisted mostly of bundles of newspapers and periodicals, the compartments into which it was sorted were very large. The many compartments for one distribution scheme occupied so much space that a method was used which allowed three or four distributors to use the same set of distribution boxes. This group of distributors stood on the floor in front of tiers of compartments, arranged about them on three sides, the lowest box being 6 feet, and the highest 10 feet, above the floor. The distributor stood in the center and threw mail into the compartments. To throw mail into the correct compartments, it was necessary to throw much of it at difficult angles, and this required a high degree of skill. Often when a package consisting of a number of newspapers hit the side of the case, the string broke or slipped and each of the newspapers had to be thrown separately. When a package was thrown into the wrong box it was necessary to climb up and withdraw it. Accuracy could be developed, if at all, only after months of training. Throwing to the high boxes was a great strain on the arms and necks of the distributors.

A new arrangement was tried in which the distributors stood on a platform the same height as the boxes into which they threw mail. A time study was made of the amount of mail thrown, and of the number of errors, both under the old method of working and under the new. Both the effort required in the work and the number of errors made were materially reduced when the distributors' position was elevated. An apparent advantage of the old method was that four distributors could work in the same section at one time. It was found, however, that under the new plan two could, with less strain and with the expenditure of less energy, accomplish as much as four had been able to do.

This improvement in the arrangement of work shows that it is possible to change a task which requires considerable skill and two or three months of training, one for which many are unable to qualify, to a much simpler task, requiring no unusual skill or endurance. To measure the abilities required for this position under the old procedure, it would have been necessary to devise special aptitude tests and motor coördination tests, requiring complicated equipment. It would have been necessary to administer the motor coördination tests to each competitor individually. Had effort been devoted immediately to the development of such tests, a heavy expense for construction, equipment, and administration would have been involved. The expense for the selection of the relatively few distributors needed for this particular work would have been greater than has been the total expense, under the method developed, for testing thousands of applicants for the more important distribution work.

Many improvements in the methods of distributing second-class mail have been made by the Post Office Department. For example, the arrangement of a number of sacks in a horizontal distribution frame simplified the task of sorting, increased production, and resulted in the mail being thrown immediately into the sacks to be put on the trains.

A study in coöperation with postal officials indicated that further improvement could be made in the arrangement of the sacks. It was found that if the last row of sacks in each frame were tilted toward the distributor, time could be saved, the expenditure of energy lessened, and accuracy increased.

Personnel research should have as one of its major purposes not only the conservation of energy, but the relieving of any unnecessary strain.

REQUIREMENTS OF A GOOD EXAMINATION

Distributors in a post office receive their training in the post office. There is no other place where the work can be learned. The examination is, therefore, for the purpose of measuring not acquired proficiency in the work, but the aptitude necessary to develop such proficiency.

The primary requirement of any examination is that it be truly selective, that it differentiate between those who do and those who do not possess the qualifications necessary for the particular work. To meet this requirement, the test must measure qualities essential for success in the work.

Elimination of those whose inability is certain is not sufficient. The test must also differentiate, as exactly as possible, among different degrees of ability possessed by those who are sufficiently capable to merit being placed on the register of eligibles for appointment. In order to do this a test must be correctly focused as to difficulty. In constructing the test it was necessary to determine the best level and the best range of difficulty, and also the length of test necessary to enable the competitors to demonstrate their relative abilities.

When the number of appointments to be made to any position is very

large, it is necessary to give examinations frequently for that work. Where the number applying for one examination is greater than can be accommodated at one time, owing to the limited desk space and examiners available, the examination must be given in two or more successive sessions. To insure fairness, an alternative form of the examination must be provided each time the examination is held. The successful competitors in such examinations are to be listed on one register in the order of their ratings; therefore all the alternative forms of the examination must be equal, so that a given score in one will indicate qualifications equal to those indicated by the same score in another, as nearly as this is possible. An important consideration in the construction of an examination is, therefore, the ease and the accuracy with which it can be duplicated, consistent with high selective value.

Another requirement is that the test be reliable under different examining conditions. Competitors must be measured on an equal basis, regardless of where the examination is held, by whom it is conducted, the number examined at the same time, or the size of the examination room. When an examination is to be held in hundreds of cities by hundreds of examiners, such fairness can best be insured by the use of examination forms for which the only directions the examiner need give to the competitors are "Start," and "Stop." Likewise, since many persons work on the scoring of examinations, tests should be so constructed that a competitor's grade will be the same regardless of who scores the papers. Simplicity and objectivity, both in administration and in scoring of written examinations, give competitors' grades which are not affected by the personal judgments of the examiners.

The time required for the administration and the scoring of tests, and also the expense of their printing, are important practical considerations.

With these requirements in mind, the Research Division constructed tests to measure the qualifications which the analysis of duties had indicated were necessary for success in mail distribution.

THE TESTS USED EXPERIMENTALLY

Employees engaged in mail distribution in post offices have been selected heretofore by means of an examination which consisted of spelling, copying from printed text, letter writing, and arithmetic.

The new tests constructed and tried in this study comprise a test designed to measure general adaptability, and special tests designed to measure the special abilities required for success in the work of mail distributors.

In the test of general adaptability, items are arranged in order of difficulty, each item being proportionately more difficult than the item which precedes it. The amount of the test completed by a competitor is therefore an indication of the extent of the competitor's ability to interpret and reason. The test is administered with only one timing.[3]

The special test forms which have been studied include the following:

[3] Samples are shown facing page 360.

1. *Sorting.* At the top of the page there are squares representing boxes. Each square is numbered. Within each square are printed the names of three or more cities indicating that mail for those cities is to be placed in that box. Below these boxes is printed a list consisting of repetitions of the names which appear in the scheme. Each of the names in the list represents a letter or other piece of mail for the city named. On a line which follows each name, the person taking the examination is to write the number of the box into which a piece of mail so addressed would be thrown.

In preliminary trials other types of sorting tests were studied, differing in the number of city names in the distribution boxes, and in the ease with which the names could be associated. Tests were presented with five- or ten-minute allowance, and also without a time allowance for memorizing of the schemes. In all of these forms, speed was an important factor in determining scores.

2. *Memory.* As an additional memory test, a type of distribution test was made in which the competitor is directed first to memorize a distribution scheme. He then turns the sheet over, and finds on the back the list of cities after which numbers are to be written. The list is only long enough to give each name once, and speed is not considered.

An alternative form was given with each of the foregoing special tests to check the reliability of the test.

Another test of memory also is based on a distribution scheme. For the memorizing of this scheme, which comprises only seven cities, each having a number, eight minutes are allowed. The competitor is then directed to turn the page and write from memory the correct number after each of the cities listed. At different points in the test the competitor finds directions as to changes in the routing of his mail, according to which he must make changes in his distribution scheme.

3. *Directions Test.* A test representing a simple distribution scheme was included. The difference between this test and the last memory test described above is that there are more names in the test and it is not dependent upon memory. The original distribution scheme, together with the changes in the scheme, can be referred to by the competitor at any time throughout the taking of the test.

Additional tests to measure other factors were included.

Preliminary trials of new or of revised test forms are made on small groups of persons in order to determine the most desirable administrative procedure and time allowances and to determine the effect of any changes found desirable. This is necessary since changes in the timing or in the method of giving a test would affect the results, and therefore greatly decrease the value of any data compiled before such changes were made. Results of such minor trials are not reported.

Such a trial pointed out a test in which improvement could be made. The test papers disclosed the fact that, despite effort to avoid such a possibility, there were three different ways in which the persons examined

could perform the test; in other words, some distributors found a way of eliminating some of the real difficulty of the test, while others made the problem more difficult than was intended. A great objection to the use of this type of test in examinations is that its value would be lost if some competitors succeeded, through previous examination or other means, in familiarizing themselves with the test forms and the simplest way of performing the task. A test which can be performed in two or more ways fails to give one definite basis, which is necessary for comparison of the competitors' aptitudes. For this reason it was necessary to revise the form of this test to what is now called the Following Instructions Test.[4]

CRITERION: THE BASIS FOR TESTING THE TESTS

For purposes of trial the proposed tests were given to a group of distributors employed in the Chicago Post Office. After this trial each test included in the test program was studied individually. The relative abilities of the employees on whom the proposed tests were tried were known, and the degree to which scores on the test indicated the relative abilities of those tested was determined statistically. The known ratings of relative ability of employees will hereafter be referred to as the criterion.[5]

[4] See samples of test forms facing page 360.

[5] The statistical measure of the relation between test scores and criterion will be referred to as the correlation. The interrelationship of tests will be referred to as their intercorrelation.

Inability of the experimenter to secure a reliable rating of the abilities of those who take experimental tests is responsible for the failure of many test studies. It is desirable that the ratings of actual abilities of those on whom tests are to be tried be secured before the expense of giving and correcting trial tests is undertaken.

An additional reason why efficiency records should be secured before the tests are given is to insure, in so far as practicable, that the study group is representative in ability of the entire range which is found in the class of persons to whom the test will be given in the actual examinations.

The criterion used in this study consisted of three factors:

1. The average number of pounds of first-class mail distributed by each employee during a period of six months, together with the amount of time in minutes spent on this distribution.

2. The records in a monthly case examination. This examination measures the rate and accuracy with which each worker can distribute into his distribution case.

3. Foremen's ratings. These were made on a graphic rating scale which had been devised for securing ratings on the fundamental qualifications for the position of mail distributor.

The selection of the groups of distributors to whom the tests would be given in the trial was determined largely by the fact that for each of the groups selected the ratings of two foremen could be secured. The distributors who were tested work from one o'clock until nine; the first group of foremen leaves and a second goes on

duty at five. It was therefore possible to secure independent ratings from the day and the night foremen. Where there was a wide difference between the ratings of the day foreman and those of the night foreman on an individual, that distributor was not included in the study of experimental tests.

Three weeks after these first ratings were made, each foreman was requested again to assign a rating to each distributor. This second graphic rating was compared with the first, and wherever differences were found, a final rating was assigned only after conference with the rater. In a number of cases, explaining the difference in rating, the foreman stated: "I rated this man somewhat below average before, but since then I have decided that he should be rated a point or two higher." In the majority of cases, the first ratings remained unchanged.

After the second graphic rating was made, each foreman made a third rating for each distributor, on a man-to-man plan. Each foreman selected, according to his estimation, the poorest distributor, the most efficient, the average distributor, and a distributor halfway between average and excellent, and one halfway between average and very poor. The two foremen of each group of distributors came to an agreement as to their standards of poor, average, and excellent distributors. In determining these bases for comparison, an effort was made also to use employees who were known by all the foremen in order that the same standards of average and extremes in each quality might be used by all who were making ratings. With these standards for comparison, each foreman rated each of his distributors for the third time, using this man-to-man method.

Comparisons of the different ratings by each foreman, as well as of the ratings by the different foremen of the same distributor, tended to eliminate the errors which a temporary underestimation or overestimation of any individual might have introduced. The foremen showed keen interest and eagerly coöperated in comparing their ratings with those made by other foremen.

Both the actual amount of work performed by each man and the ratings of the foremen were used to establish the final efficiency ratings of the distributors against which to check the test results.

The use of a graphic rating scale does not insure a valid criterion; it is an aid if those using it know the relative qualifications of the persons rated and use the greatest care in transferring this knowledge to paper. In the study under discussion it was especially fortunate that ratings were secured from foremen who knew well the work of their distributors, and who were willing to coöperate in the trial. *In all investigations of the Research Division, as much effort is devoted to the securing of a reliable criterion as to any other phase of the work.*

RESULTS OF FIRST TRIAL

The effectiveness of a test depends upon the degree to which it distinguishes qualified applicants from those who are

not qualified and differentiates among the degrees of aptitude for the work.

A high relation was found between test scores and criterion in the first trial.[6] The findings indicated that a passing score could be set so that the tests, when used in selecting new distributors would exclude the great majority of those whose efficiency would be below the average of the group of employees tested, and at the same time, would pass the great majority of those who would be superior or above average in efficiency.

SELECTION OF TESTS FROM SECOND TRIAL

In a similar study which was conducted two months later, approximately the same relation was found. In both trials, the same three tests were found to be the most selective and were given relative weights according to their determined value.

Each test included in the trials was analyzed individually. Before any test was included in the examination finally adopted, it was determined that that particular test meets the specifications previously mentioned, namely:

1. Measures qualities essential for success in the particular position.
2. Differentiates among different degrees of ability.
   - *a*. Is focused at the correct difficulty.
   - *b*. Is of correct range of difficulty.
3. Can be readily duplicated.
4. Is reliable, that is, such that a competitor will make approximately the same grade on any alternative series.
5. Is objective
   - *a*. In administration.
   - *b*. In scoring.
6. Is practicable
   - *a*. In time required and facility in administration.
   - *b*. In time required and facility in scoring.
   - *c*. In cost of printing.

In addition to meeting these requirements, each test which was finally used adds to the selective value of the examination as a whole.

The first test finally selected from those fulfilling the requirements specified was the one having the closest relation with the efficiency ratings of the trial group. The next test selected was not necessarily the one which shows the next highest relation with the efficiency ratings, but the one which best measures important qualifications not measured by the one first selected. In other words, the second test chosen was the one which best supplements the first test.

The third test selected was that which best measures important qualifications not measured by the combination of the first two. It was found that none of the remaining tests which were tried would add enough to the total selective value of the examination to warrant the addition of a fourth test.

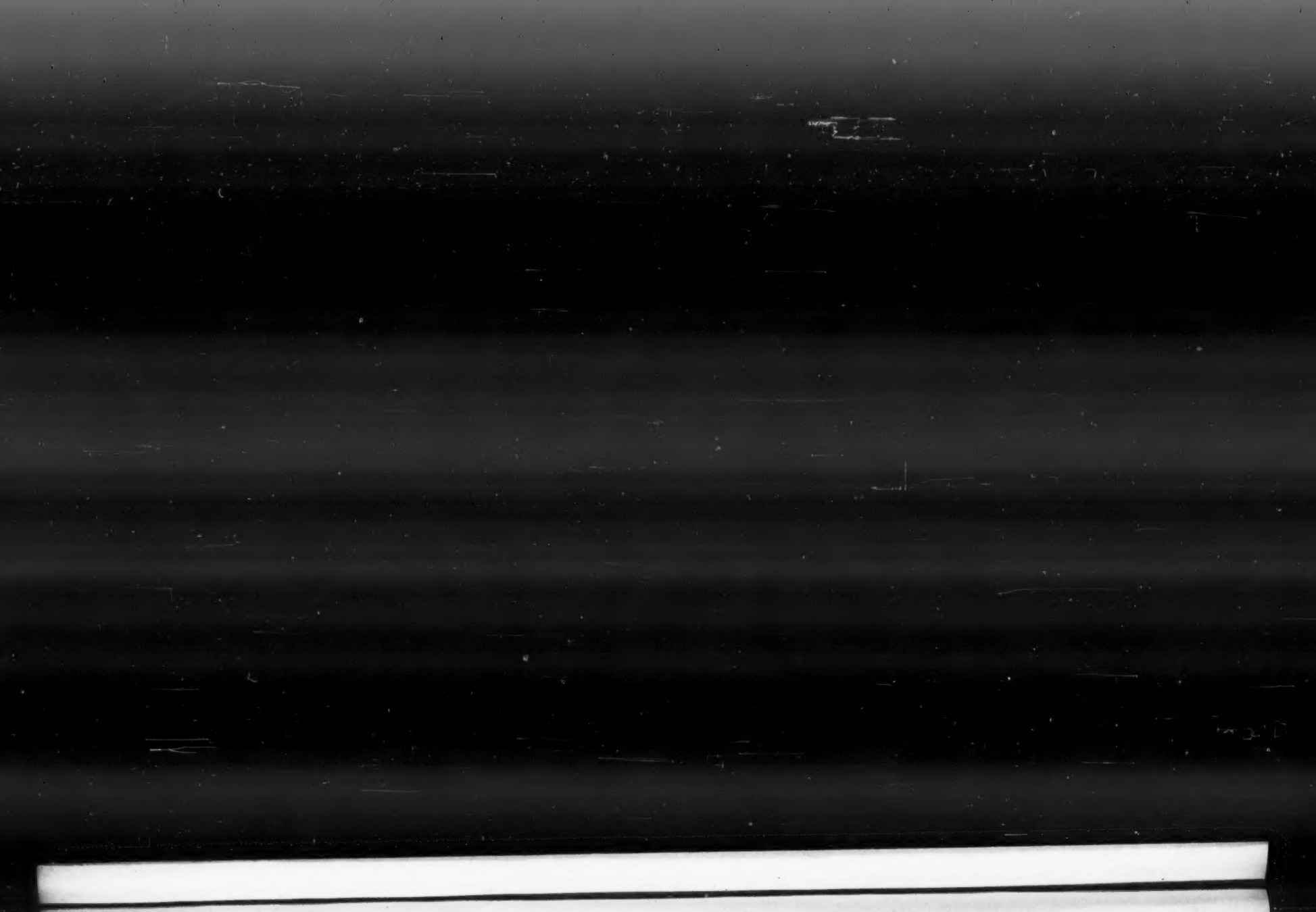
CONSTRUCTION OF ALTERNATIVE SERIES

In the construction of alternative series of General Tests,[7] every item was tried on a large group of employees in order to determine its degree of difficulty and selective value.

One hundred items were selected for each series of the examination. Like the model form developed from trial on the basis of scores made by

[6] Correlation between test scores and criterion, first trial, 0.652.

[7] See samples facing this page.



SAMPLE QUESTIONS

The general character of the examination is indicated by the following material. Study it carefully, and answer each question.

GENERAL TESTS

Write the *number* of the *best* answer on the line at the right.

1. The business of mail-order firms has been greatly increased by the introduction of (1)special delivery (2)parcel post (3)postal savings (4)airplane mail (5)lock boxes. . . . . ____

Write "2" on the line because "parcel post," numbered 2, is the **best** answer.

2. Letters are delivered promptly by the post office so that the (1)office can be closed on time (2)inclosures will not be lost (3)mail will not be heavy (4)letters will not be damaged (5)public may not be inconvenienced. . . . . ____

3. Mail which is sent from an addressee's old address to his new address is said to be (1)returned (2)canceled (3)forwarded (4)received (5)detained. . . . . ____

4. A *fundamental* point is one that is (1)final (2)drastic (3)emphasized (4)essential (5)difficult. . . . . ____

5. The saying, "To do, one must be doing," means most nearly (1)What you do, do thoroughly. (2)More is needed than good intentions. (3)Think before you act. (4)By our deeds we are known. (5)Well begun is *half* done. . . . . ____

Statement (2)means most nearly the same as "To do, one must be doing," so write 2 on the line.

6. The saying, "Many hands make light work," means most nearly (1)Most people prefer easy jobs. (2)When several work together the task is easier. (3)Much light work can be done by hand. (4)There are often too many to help. (5)One always tries harder when working alone. . . . . ____

In each of the two sentences below, the word printed in italics has been misspelled. It is spelled according to its sound. Write the correct spelling of this word on the line at the right.

7. The plan was *sanktshunsed* by the committee. . . . . _____

8. His *nollege* of the situation was remarkable. . . . . _____

9. Which one of these five may be applied to both *books* and *magazines*, but not to *postmen*? (1)expected (2)reliable (3)accurate (4)authorized (5)published. . . . . ____

Answer "5" is the only one which can be applied to both "books" and "magazines," but not to "postman," so write "5" on the line.

10. Which one of these five may be applied to both *post office* and *street*, but not to *private dwelling*? (1)built (2)public (3)located (4)occupied (5)brick. . . . . ____

In each of the two following questions, the first two words in capital letters go together in some way. Find how they are related. Then write a *number* to show which of the last five words goes with the third word in capital letters in the same way that the second word in capital letters goes with the first.

11. SACK is to MAIL as PURSE is to (1)money (2)suitcase (3)bag (4)owner (5)luxury. . ____

12. IDLE is to BUSY as ABSENCE is to (1)alone (2)willingness (3)presence (4)sadness (5)dismissal. . . . . ____

13. Over what body does the Vice President preside? (1)Senate (2)House of Representatives (3)Interior Department (4)Supreme Court (5)Cabinet. . . . . ____

Read the quotation and answer the question which follows it.

14. "Street letter boxes in the business districts have their hours for collection and exactness is required of collectors in observing those hours. Any business man can figure with certainty upon the time of his next service if he uses these boxes."

What characteristic of postal service is emphasized in the quotation? (1)cheapness (2)extent (3)safety (4)speed (5)regularity. . . . . _____

15. If 4 men can distribute 700 letters in 2 hours, in how many hours would they distribute 1,750 letters, at the same rate? . . . . . ____*hrs.*

Below are the correct answers to the "General Tests" samples. Check your answers with these and see how many errors you have made. Be sure you understand how the questions are to be answered, so that you will not make errors in the test.

FOLLOWING INSTRUCTIONS

This is a test of your ability to follow instructions. All directions must be followed exactly as shown in this sample test.

Below, at the left, is a list of post offices, called a SORTING SCHEME. After each of these offices is a letter. For example: After "Bowers" is the letter "A". This refers to the "A" in the KEY at the right, which reads "A Felton 4." The "A" after "Bowers" means that mail for Bowers is routed by way of Felton.

The numbers after the names in the KEY indicate the trains on which mail for those post offices must be placed. After "Felton" in the KEY you will find the number 4. This means that mail for Felton is sent on Train 4. Since mail for Bowers is routed by way of Felton, mail for Bowers, also, would be sent on Train 4.

SORTING SCHEME		KEY Mail sent by way of—	
Allen	C	A	Felton 4
Bowers	A	B	Union 8
Camden	C	C	Camden 6
Daly	I	D	Woods
Denham	E	E	Allen
Dover	C	H	Turner 9
Felton	A	I	Dover
Malter	D		
Turner	H		
Viola	B		
Woods	A		
Union	B		

YOU MUST FOLLOW DIRECTIONS EXACTLY AS GIVEN. Make your numbers and letters clear, to avoid mistakes.

Look at the name "Woods" in the KEY. It is not followed by a number. Write after it the *letter* which you find after "Woods" in the SORTING SCHEME. Your KEY will now read "D Woods *A*." Find the letters after Allen and Dover in the SORTING SCHEME and write them after those names in the KEY.

Never put numbers in the SORTING SCHEME.

On the line after each of the following offices, write the *number* of the train on which you would send mail for that office.

To find the number which should be written after Viola, look for Viola in the SORTING SCHEME. After it is the letter **B**. This refers to KEY B Union 8, and means that mail for Viola is routed through Union on Train 8.

After Denham is the letter **E**. This refers to KEY E Allen *C*, and means that mail for Denham is routed through Allen by way of **C**, and KEY C reads Camden, on Train "6." Write "*6*" after "Denham" in the list below. Now write the train numbers after the others.

Viola	*8*	Bowers	___	Turner	___
Denham	___	Daly	___	Malter	___

You now receive Bulletin No. 1:

CHANGES IN ROUTING

Never change the letter before the name in the KEY. When a letter or number is changed, it is always the letter or number *after* the name.

(Make changes in both SORTING SCHEME and KEY *if* the names are in both.)

Woods by way of **C**
Dover by way of **B**

To make the change for Woods, cross out the "A" after "Woods" in the SORTING SCHEME and write "*C*." Then your SORTING SCHEME for Woods should read: "Woods **A** *C*." This means that mail for Woods is now sent by way of "C Camden 6." Next look for "Woods" in the KEY, and change the "*A*" after it to "*C*." Make the change for Dover so that your SORTING SCHEME will read: "Dover **C** *B*," and the KEY will read "I Dover **C** *B*."

After making the above changes, write the *number* of the train on which you would send mail for each of the following offices:

Woods	___	Camden	___	Dover	___
Felton	___	Union	___	Allen	___

Next you receive Bulletin No. 2.

CHANGES IN ROUTING

(Make changes in both SORTING SCHEME and KEY, *if* the names are in both)

Change KEY C to read: C Camden 7
Change KEY A to read: A Train 5
Felton by way of **B**
Change KEY E to read: E Allen 7
Allen by way of **E**

To make the change for KEY C, cross out the 6 after Camden in the KEY and write "*8*," because the train for Camden has been changed from "6" to "8."

15. If 4 men can distribute 700 letters in 2 hours, in how many hours would they distribute 1,750 letters, at the same rate? . . . . . ___hrs.

Below are the correct answers to the "General Tests" samples. Check your answers with these and see how many errors you have made. Be sure you understand how the questions are to be answered, so that you will not make errors in the test.

Question	Answer	Question	Answer
No. 1	2	No. 7	mentioned
No. 2	5	No. 8	knowledge
No. 3	3	No. 9	5
No. 4	4	No. 10	2
No. 5	2	No. 11	1
No. 6	2	No. 12	3
		No. 13	1
		No. 14	5
		No. 15	5 hrs

SORTING

In the SORTING SCHEME below, each square represents a box for mail going to the cities named in that square. You will be required to study the SORTING SCHEME and then write after each city in the following list the number of the box in which you would put mail for that place. Look at the first name in the list, "Harbur." The number "2" is written after it because Harbur is in the box numbered 2. "Leadwood" is in box number 8, so "8" should always be written after Leadwood.

Work straight down each column, taking the cities in order. You will receive no credit if you skip cities and scatter your answers.

Study the SORTING SCHEME for 10 minutes, to get it thoroughly in mind before beginning to write.

SORTING SCHEME

1 Red Bank, Painter, Carter	3 Denver, Rayburn, Sunset	5 Texan, Mesa, Grande	7 Edison, Millbrook, Appleton	9 Wheeler, Forest, Sumter
2 Harbur, Refuge, Concord	4 Eastlake, Boston, Lakeview	6 Randall, Lowell, Porter	8 Leadwood, Fox, Morton	10 Camden, Roswell, Chester

You may look back at the SORTING SCHEME as often as you wish.
You may not have time to finish the test. Do as much as you can in the time allowed.

City	Box No.	City	Box No.	City	Box No.	City	Box No.	City	Box No.	City	Box No.
Harbur	2	Red Bank	1	Refuge	2	Concord	2	Camden	10	Mesa	5
Leadwood	8	Lowell	6	Boston	4	Rayburn	3	Millbrook	7	Appleton	7
Fox	8	Carter	1	Lakeview	4	Grande	5	Forest	9	Chester	10
Edison	7	Denver	3	Roswell	10	Morton	8	Randall	6	Texan	5
Porter	6	Sunset	3	Sumter	9	Eastlake	4	Wheeler	9		
Eastlake	4	Refuge	2	Edison	7	Appleton	7	Roswell	10	Carter	1
Grande	5	Morton	8	Fox	8	Texan	5	Red Bank	1	Wheeler	9
Painter	1	Porter	6	Lowell	6	Boston	4	Mesa	5	Edison	7
Millbrook	7	Denver	3	Concord	2	Sumter	9	Refuge	2	Rayburn	3
Boston	4	Lakeview	4	Randall	6	Painter	1	Fox	8	Leadwood	8

Make three or four similar schemes with longer lists, and practise on them.

Change KEY C to read: C Camden 9
Change KEY A to read: A Train 5
Felton by way of B

Change KEY E to read: E Allen 7
Allen by way of E

To make the change for KEY C, cross out the 6 after Camden in the KEY and write "*9*," because the train for Camden has been changed from "6" to "9."

To change KEY "A," cross out "Felton 4," and write "*Train 5*." This means that mail for offices marked "A" is no longer sent through Felton but is routed direct on Train 5.

Make the other changes ordered.

Write the number of the train on which you would send mail for:

Bowers .... ___		Felton .... ___		Daly .... ___	
Dover .... ___		Denham .... ___		Allen .... ___	

Bulletin No. 3:

OFFICES ESTABLISHED (Add to SORTING SCHEME)	CHANGES IN ROUTING (Make changes in both SORTING SCHEME and KEY if the names are in both)
Becker by way of A Wise by way of D	Add to KEY: J Train 4 Change KEY D to read: D Train 8 Change KEY E to read: E Bowers Daly by way of J Union by way of H

To add Becker to the SORTING SCHEME, write "*Becker A*" on the first dotted line at the end of the SORTING SCHEME. Next, add "Wise D."

To add "J Train 4" to the KEY, write "*J Train 4*" on the first dotted line at the end of the KEY.

To make the change for KEY "E," cross out "Allen 7" in the KEY and write "*Bowers*." Then find the letter after "Bowers" in the SORTING SCHEME, and write it after the name in the KEY.

To make the change for Union, cross out "8" *after* "Union," in the SORTING SCHEME, and write "*H*," then, in the KEY, cross out "8" after Union and write "*H*."

Make the other changes ordered.

Write the number of the train on which you would send mail for:

Becker ... ___		Union ... ___		Denham ... ___		Allen ... ___		Malter ... ___	
Daly ... ___		Wise ... ___		Felton ... ___		Camden ... ___		Viola ... ___	

NOTE.—*If you have answered "8" in place of "9" for Viola, it is because you have failed to follow the last direction in Bulletin No. 3. If you had changed Union to H in both KEY and SORTING SCHEME, your answer would be "9."*

If you have made all changes correctly, your SORTING SCHEME and KEY should read:

SORTING SCHEME

Allen E		Bowers A		Camden C		Daly J		Denham E	
Dover B		Felton A B		Malter D		Turner H		Viola E	
Woods C		Union H		Becker A		Wise D			

KEY

	Mail sent by way of	The correct answers to the above tests are:				
A ~~Felton 4~~	Train 5					
B Union ~~8~~ H		8	4	9		
C Camden ~~6~~ 9		6	6	4		
D ~~Woods~~ ~~C~~ Train 8						
E ~~Allen~~ ~~7~~ Bowers		6	6	8		
H Turner ~~8~~		4	8	8		
I Dover ~~C~~ B						
J Train 4		5	8	8		
		8	7	7		
		5	9	5	5	8
		4	8	9	2	9

distributors employed in the service, these items ranged in difficulty from the easiest to the hardest, and were so selected that the difficulty increased throughout the test, in equal degrees, as on a scale. Six alternative series of the same examination were made, all equal in difficulty.

SAMPLE TESTS—AN AID TO RELIABILITY

The introduction of new types of examinations presents difficulties in administration. One of the most important of these is the competitors' lack of familiarity with the new test forms. When the form of the examination appears mysterious or confusing, there is danger that the nervousness which any examination may cause will be even greater and tend more to influence examination results.

Another danger is that competitors may differ in the time they require to interpret directions as well as in the degree of their familiarity with the form of the test. Some may have taken or at least seen such a test, while others may not. To the extent of these differences, the competitors' scores will be less indicative of differences in the aptitudes measured, especially if it is a speed test. Under these conditions, the test may fail entirely in its purpose, and the scores indicate mainly differences in competitors' familiarity with the form or in their ability to interpret directions. If ability to understand and follow directions is required in a position, a directions test is included in the examination for that position, and is weighted according to its importance.

If reading of directions and understanding how to proceed with the examination require a considerable part of the examination time, those competitors attempting the examination for the second time would have a distinct advantage over new competitors in so far as a time element is involved.

Every precaution has been taken in connection with the new examination for selecting employees in post offices, in order to be certain that all competitors exactly understand how they are to proceed in the examination, thereby insuring that they have equal opportunity.

The use of sample tests has helped to solve these difficulties. Facing page 360 are shown the samples of the directions and test items, exactly as these samples are printed on the announcement of the examination which applicants receive with their application blanks. By means of these samples each competitor has an opportunity to become thoroughly familiar with the test forms before reporting for the examination. Again, in the examination room, a practice test is given to the competitor just before he takes the actual examination. A list of the correct answers to these practice items is printed at the bottom of the sample page. As the competitor compares his answers with these, his attention is directed to any points which he might otherwise fail to notice. *By giving equal advantage to all competitors, the use of samples aids in maintaining the reliability of examinations.* It is an additional precaution to insure that only the best qualified will receive high scores and be appointed to the service.

VERIFYING THE SELECTIVE VALUE OF THE TESTS

A final study was made in order to verify the value of the new examination. The tests, with samples, exactly as printed for use in the new examination, were given to a group of 124 employees of the mail department in the Chicago Post Office, for whom accurate efficiency records were available.[8]

The relation between test scores and criterion was remarkably constant from study to study.[10]

The final examination scores differentiate among the employees as shown in the following diagram.

The vertical line 0–0 is the dividing line on either side of which 50 per cent of the efficiency ratings of the whole group fall.[11] It will be referred to as the average. Each horizontal bar represents one-quarter of the group tested. The top bar represents the distributors who made the highest 25 per cent of the test scores, hereafter referred to as Group A. The lowest bar represents those who made

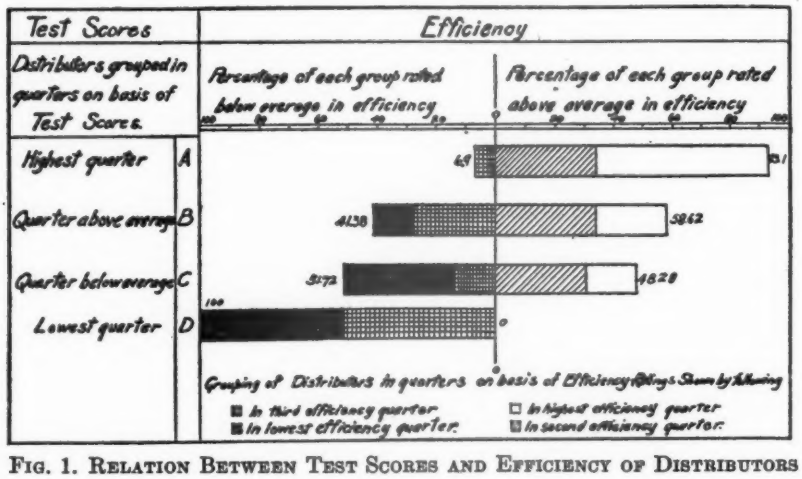


FIG. 1. RELATION BETWEEN TEST SCORES AND EFFICIENCY OF DISTRIBUTORS

After these new tests were given in an actual competitive examination, the extent to which the tests measure independent factors was again verified, this time by the scores of 600 competitors. The results vary little from those of the study of employees' scores.[9]

[8] The correlation obtained between test scores and efficiency ratings when the three tests were combined by multiple correlation method and weighted for this position was 0.7156.

[9] Intercorrelations based on scores of 600 competitors were:

Sorting Test with Following Instructions Test.....0.435
Sorting Test with General Tests..0.356
Following Instructions Test with General Tests.....0.538

On the papers of the distributors on whom the final trial was made, the intercorrelations were:

Sorting Test with Following Instructions Test.....0.550
Sorting Test with General Tests..0.454
Following Instructions Test with General Tests.....0.568

the lowest 25 per cent of the test scores, or Group D. In each bar, the part at the right of the vertical line indicates the percentage of that group rated above average in efficiency; the part at the left shows the percentage of the group rated below average. The highest 25 per cent in efficiency of the total number of distributors is represented by the solid white, and the lowest 25 per cent of the total number by the solid black part.

This chart shows that of 100 competitors equal in test scores to those of Group D, the lowest group, 100 per cent would be expected to be below the average in efficiency of the distributors tested, all of bar D on the chart falling to the left of the line 0–0. A low test score is actually indicative of lack of aptitude for the work.

Not more than 25 per cent of the applicants are likely to receive appointments, and we are therefore concerned chiefly with the top bar. This bar shows that those who make the highest test scores are the distributors who are highest in efficiency. The chances are 93.1 to 6.9, or 13 to 1, that their efficiency will be above the average of the distributors who were tested. In other words, it may be seen from the chart that, if 100 competitors make scores equal to those made by Group A, 93 will be likely to be more efficient than the average of the distributors who were tested; and 59 of these 93, represented by the solid white part of the top bar, may be expected to be as efficient as the 25 per cent most rapid and accurate of the distributors on whom the tests have been tried. *Thus it may be expected that 93 per cent of all the appointees who will be selected through the new examination will be more efficient than the average of the present employees.*

While the test measures the essential qualifications for the work of a distributor, it is not dependent upon experience or technical information. This is evidenced by the fact that thirteen thousand competitors' papers show the same average and range of scores as do the papers of postoffice employees who were tested.

The coöperation of the employees who took part in the study has played a very important part in improving the examination. The entire plan closely harmonizes with their recommendations for higher entrance requirements.[12]

These may be compared with the intercorrelations of the Special Tests selected for the Railway Postal Clerk Examination. Based on 1000 cases, these range from 0.285 to 0.444, showing that each test measures something not measured by any of the other tests. The intercorrelation of the General Tests and the Special Tests in the Railway Postal Clerk Examination is 0.514.

[10] The correlations between General Tests and criterion are:

First trial	0.440
Second trial	0.373
Third trial	0.404

The correlations between Special Tests and criterion are:

First trial	0.652
Second trial	0.612
Third trial	0.694

[11] Median.

[12] Mr. George, President of the National Federation of Post Office Clerks affiliated with the American Federation of Labor, after reviewing the study and the results of the examination says:

"I am glad to learn that the new examination promises not simply to raise the en-

The object of the new examination *is not to force employees to work beyond their normal ability. Its purpose is to select employees with aptitude for the work, employees who will be able to memorize the schemes, keep up their distribution books, and perform the task with a higher degree of rapidity and accuracy but without strain or excessive effort.*

The savings effected by this investigation, through reducing the time and nervous strain required in reading many thousands of test papers, and through reducing the cost of preparing alternative examinations, as well as through higher efficiency of the new employees selected by the improved methods, will be fully described in Part II.

(*To be concluded*)

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trance requirements, which is in accord with resolutions adopted by our organization, but that it measures much more accurately the qualifications required for the position and is a more practical test."

Interests Studied Quantitatively

Measurement of Differences Between Socially and Mechanically Inclined, in Relation to Vocational Selection

By Ruth M. Hubbard, *University of Minnesota*

Personal preferences, likes and dislikes, often loom large in a decision regarding an occupation or career. Can these elusive affective characteristics of young people be measured objectively? A significant step in this direction was taken by Miner, B. V. Moore, Freyd and Ream. Using their technique, Miss Hubbard has advanced still further our understanding of the differences between persons with a bent toward manipulation of mechanisms and persons whose interests are primarily in dealing with people.

THE study of interests and their relation to vocational adjustments is beginning to hold the attention of many psychologists, especially those interested in vocational guidance. We are finding, as we found with the very first work on intelligence, that subjective ratings and subjective methods are inadequate as bases for scientific conclusions; that to have scientific value the work on interests must be done with quantitative methods.[1]

[1] The writer wishes to acknowledge the help and inspiration of Professor Donald G. Paterson of the University of Minnesota, under whose direction this work was done as part of a research, the complete data of which are available in an unpublished manuscript in the University of Minnesota Library under the title, "Evaluation of Quantitative Methods of Measuring Interests" by Ruth M. Hubbard.

SUMMARY OF PREVIOUS STUDIES

One of the first quantitative investigations of interests was made by Max Freyd at Carnegie Institute of Technology (1). He used a questionnaire consisting of lists of one hundred occupations and about one hundred and fifty other items, such as various sorts of people, magazines and books, sports and other kinds of pastimes. After each item were the letters *L. I. D.* and the subject was instructed to encircle *L* if he liked the item, *D* if he disliked it and *I* if he was indifferent to it. This form gave opportunity for recording a maximum of interest-attitudes with a minimum of time, space and effort. He tried out the questionnaire first on two small groups of students (43 mechanical engineering and 30 industries students) and found

significant differences between the groups. The statistical requirement that an item must fulfill to be considered significant was this: the differences in percentages crossing it out in the two groups must be at least twice the standard error of that difference. Each item crossed out by a significantly larger percentage of engineers was scored plus one; each item crossed out by a significantly larger percentage of industries students was scored minus one; and any man's final score was the algebraic sum of his pluses and minuses. He scored the blanks and found the two groups differentiated so well that only 3 of the 73 cases would not be classified correctly by their scores on the blanks. Later (2) he attempted to distinguish, not between members of two vocations but between two supposed types of people, the mechanically inclined and the socially inclined. His subjects this time were the 30 industries students and 29 students in a course of Life Insurance Salesmanship, representing respectively the mechanically inclined and the socially inclined. He found 31 significant items and distinguished the groups so successfully that in only 3 cases out of the 59 was there any overlapping. He then gave the blanks to several hundred engineers and salesmen including all grades of success in the two general courses. The groups overlapped much more this time so Freyd is not at all sure that any unselected group would show these two types, mechanically inclined and socially inclined. But if a man's score is strongly plus or strongly minus, the blank at least shows the *direction* in which he leans.

B. V. Moore (3), in trying to distinguish between kinds of engineers for placement in the various branches of the work of the Westinghouse Electric and Manufacturing Company, used a similar list of occupations in his questionnaires. When compared with the rest of his questionnaire this "Choice of Occupations" section most successfully differentiated the design engineers from the sales engineers. A year later (4), he followed up the men to find what positions they finally occupied. According to their positions 74 per cent would have been correctly placed by the questionnaire, while he had already found 68 per cent correctly placed when using the criterion of foremen's judgments after a few months' work. These facts indicate that the validity of the questionnaire increases as the criterion by which it is evaluated becomes truer. Of 41 men for whom criteria of later success were available, 90 per cent would have been classified correctly by his questionnaire. The reliability of this test compares very favorably with that of intelligence tests.

At Leland Stanford, Cowdery has used Freyd's questionnaire to distinguish the interests of lawyers, doctors and engineers. When it was given to a large number of men from the three professions Cowdery obtained an odd-even reliability coefficient of 0.9.

M. J. Ream (5) attempted to apply Freyd's method to the differentiation of good and poor salesmen but found no very significant differences between his groups. However, he did obtain an indication of the interests

of salesmen in general, which on the whole agrees with the interests Freyd found typical in his group of salesmen.

PURPOSE OF PRESENT STUDY

If Freyd's questionnaire as he gave and scored it serves to distinguish between mechanically inclined and socially inclined people there ought to be real differences between such naturally selected groups as the students in the various colleges of a large university. Here, according to the common understanding of the terms, mechanically inclined people would be represented by the engineers, socially inclined by the law students, and those midway between or including approximately equal numbers of mechanically and socially inclined, might be represented by science, literature and arts students. Can these groups, differentiated on the basis of vocation as evidenced by membership in a college, be also differentiated on the basis of mechanical and social interests as measured by Freyd's scale? This is the question which the present study tries to answer.

METHOD OF PROCEDURE

Conditions rather favorable to the investigation of this problem were available at the University of Minnesota. Every freshman is required to take an intelligence test before registering—not as an entrance examination but for experimental purposes. At the end of the intelligence test are two pages containing a modification of Freyd's questionnaire which is also filled out by every student. As previously explained the items crossed out by a significantly larger percentage of mechanically inclined people are scored one minus each; those crossed out by a significantly larger percentage of socially inclined people are scored one plus each; and an individual's score is the algebraic sum of his pluses and minuses. Hence a minus score indicates a mechanically inclined person, while a plus score indicates a socially inclined person. Freyd found the critical score (above which nearly all were socially inclined and below nearly all were mechanically inclined) to be, not 0 but +3. This fact may be taken as *a priori* evidence that the average person is slightly socially inclined rather than entirely neutral or mechanically inclined. But such an interpretation assumes that the scale is accurate enough as it stands to determine a limen for mechanical and social inclinations—for which assumption there is no warrant as yet. When the scores of large numbers of individuals are compared and a normal score and distribution are obtained, it will be possible to gauge the zero point approximately if this is considered desirable. The average score will then be the zero point and deviations therefrom in terms of sigma will represent in approximately equal units the degree of deviation of the normal individual *in the direction of* mechanical and social inclinations. That average score which would be the zero point need not fall at the algebraic zero point on Freyd's scale.

The medians and distributions of scores on the interest blanks were computed for 277 engineering freshmen, 365 science, literature and arts

TABLE 1

Frequency and cumulative percentage distributions of interest scores for the various groups tested

	FRESHMAN ENGINEERS		FREYD ENGINEERS		JORDAN JUNIOR HIGH SCHOOL BOYS		JEFFERSON JUNIOR HIGH SCHOOL BOYS		MINNESOTA SENIOR ENGINEERS		NON-TWIN-CITY FRESHMEN		ALL FRESHMAN MEN		PRE-BUSINESS SOPHOMORES		TWIN CITY FRESHMEN		SCIENCE, LITERATURE AND ARTS, WOMEN		LAW		FREYD SALESMEN	
Total number.....	277		125		154		177		156		193		365		84		172		114		101		288	
Median.....	−3.00		−2.39		−2.19		−1.637		−1.27		+0.2		+0.81		+1.16		+1.59		+2.3		+2.7		+3.42	
P.E. of Med.....	0.179		0.330		0.235		0.24		0.330		0.201		0.170		0.304		0.139		0.156		0.296		0.187	
Stand. Dev.....	3.57		4.26		3.46		3.857		4.28		3.29		3.45		3.28		3.51		3.22		3.46		3.73	
P.E. of S.D.....	0.1023		0.1817		0.1329		0.1383		0.1634		0.1115		0.0861		0.1707		0.1258		0.1439		0.1642		0.1048	
Score	Number	Cumulative per cent	Number	Cumulative per cent	Number	Cumulative per cent	Number	Cumulative per cent	Number	Cumulative per cent	Number	Cumulative per cent	Number	Cumulative per cent	Number	Cumulative per cent	Number	Cumulative per cent	Number	Cumulative per cent	Number	Cumulative per cent	Number	Cumulative per cent
+14																							1	100.0
+13																							1	99.7
+12													1	100.0			1	100.0					1	99.4
+11														99.7				99.4					8	99.1
+10											1	100.0	1	99.7				99.4	1	100.0	2	100.0	6	96.4
+9									8	100.0	2	99.5	9	99.4	1	100.0	7	99.4	1	99.1	1	98.0	15	94.4
+8			1	100.0						95.0	3	98.5	8	97.0	3	98.8	5	95.3	4	98.2	2	97.0	23	89.2
+7	1	100.0	1	99.2			2	100.0	5	95.0	6	97.0	13	94.8	2	95.2	7	92.4	9	94.7	10	95.0	32	81.2
+6	1	99.7	2	98.4				99.0	6	91.8	6	93.9	12	91.3	5	92.8	6	88.3	12	86.9	12	85.0	22	70.0
+5	1	99.4	5	96.8	1	99.8	2	99.0	2	88.0	12	90.8	28	88.1	8	86.9	16	84.8	12	76.4	13	73.0	33	62.3
+4	1	99.1	6	92.8	3	99.2	6	98.0	11	86.7	22	84.6	47	80.5	9	77.4	25	75.5	16	65.9	15	60.5	26	50.8
+3	11	98.8	5	88.0	12	97.3	7	94.6	12	79.8	17	73.1	38	67.6	10	66.7	21	61.0	10	51.9	7	46.0	31	41.8
+2	16	94.9	7	84.0	6	89.6	12	91.1	8	72.2	20	64.3	37	57.1	12	54.8	17	48.7	9	43.2	5	39.0	22	31.0
+1	19	89.2	8	78.4	8	85.8	14	84.1	15	67.1	25	53.9	41	46.9	6	40.5	16	38.8	15	35.4	7	34.0	23	23.3
0	17	82.4	9	72.0	17	80.7	28	76.1	17	57.6	24	40.8	37	35.4	9	33.4	13	29.5	6	22.2	10	27.0	12	15.3
−1	29	76.3	7	64.8	19	69.6	16	60.1	12	46.9	21	28.3	35	25.2	6	22.7	14	22.0	14	17.0	4	17.0	10	11.1
−2	28	65.7	13	59.2	16	57.1	11	50.6	22	39.3	12	17.4	20	15.7	2	15.6	8	13.9	1	4.5	5	13.0	12	7.6
−3	29	55.5	11	48.8	12	46.7	20	44.6																

−4		26	44.9	10	40.0	17	39.0	12	33.1	5	25.4	11	11.2	18	10.3	4	13.2	7	9.3	1	3.6	4	8.0	2	3.4
−5		30	35.4	11	32.0	18	27.9	12	26.1	16	22.2	1	5.5	4	5.4	4	8.4	3	5.2	1	2.7	2	4.0	4	2.7
−6		15	24.4	6	23.2	12	16.1	13	19.1	4	12.1	4	5.0	6	4.3	3	3.6	2	3.5		1.8	2	2.0		1.3
−7		15	19.0	11	18.4	5	8.2	5	12.1	6	9.5	2	3.0	5	2.7			3	2.3	1	1.8			2	1.3
−8		24	13.6	3	9.6	2	5.0	6	9.1	3	5.7	2	2.0	3	1.3			1	0.6	1	0.9			1	0.6
−9		7	4.9	6	7.2	1	3.7	4	5.7	2	3.8	2	1.0	2	0.5									1	0.3
−10		1	2.4	1	2.4	1	3.1	3	3.7	1	2.5														
−11		5	2.1	2	1.6	3	2.5	2	2.0	3	1.9														
−12			0.3				0.6		1.0																
−13		1	0.3			1	0.6	1	1.0																
−14								1	0.5																

freshman men; 114 S. L. A. freshman women; 101 first year law students, (all of whom entered their respective colleges in September, 1924); 156 engineers who were given the blanks during their senior year and who were graduated in June, 1924; and 84 men now registered in

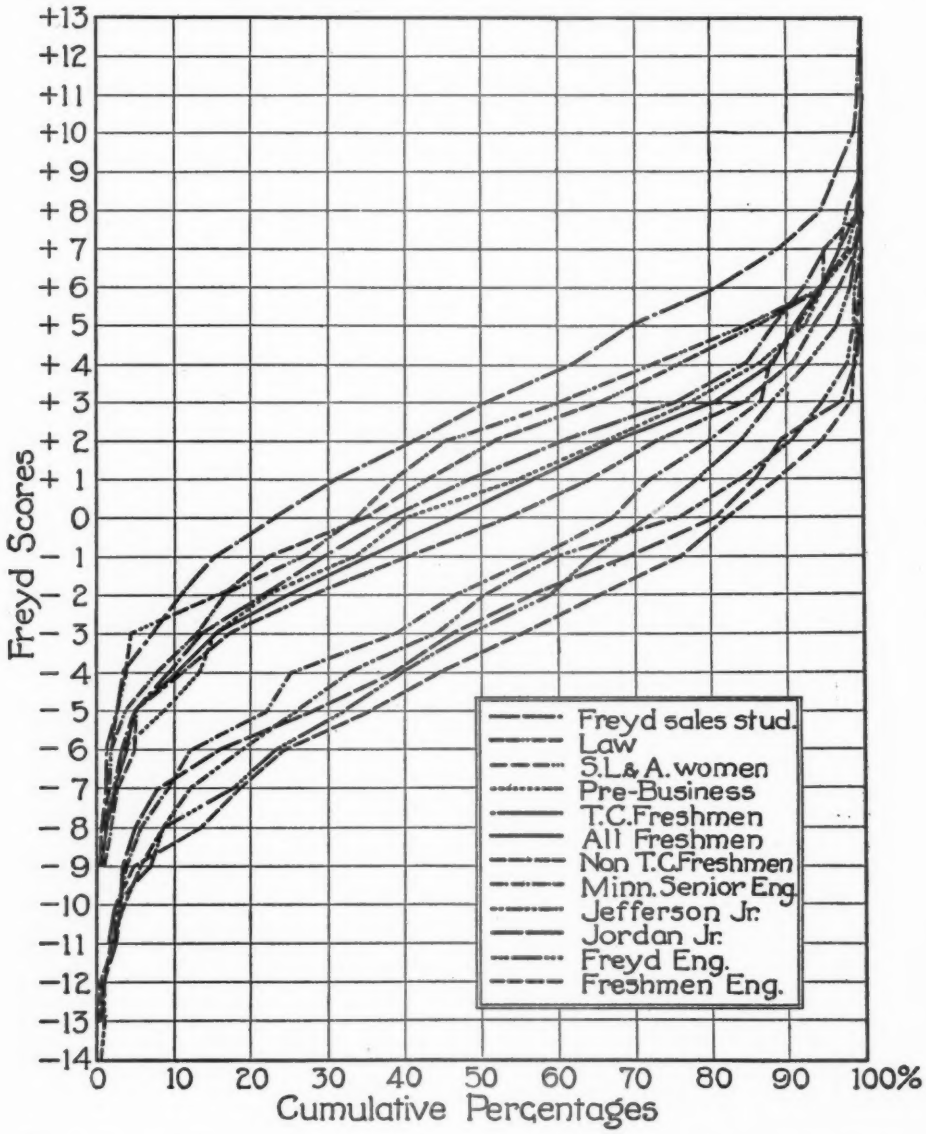

FIG. 1. GRAPHIC REPRESENTATION OF CUMULATIVE PERCENTAGE DISTRIBUTION (OGIVES) OF INTEREST SCORES FOR EACH GROUP TESTED

the School of Business, who were given the blanks in February, 1925, when their work in the School of Business was fairly well along. For 67 of this last group records made at their entrance in September, 1923, were also available. The engineering freshmen include all who entered at that time; the S. L. A. freshman men include half those who entered in September, 1924, selected by taking every other man when arranged in alphabetical order; the S. L. A. freshman women include one-third of those who entered in September, 1924, selected in the same way; the law students include all who entered at that time but exclude two women; the business students were selected by using those members of a business psychology course who had entered the University at the same time. The freshman men were divided into two groups, those whose homes were in the Twin Cities and those whose homes were outside, the groups numbering 172 and 193 respectively. The medians for Freyd's two groups were also computed from his published data.

RESULTS AND DISCUSSION

Table 1 gives the distributions for each group, the actual number and cumulative percentage for each score. It also gives the numbers in the groups, the medians,[2] probable errors of medians, standard deviations and probable errors of standard deviations.[3] These distributions are plotted in the form of ogive curves in the graph with actual scores as ordinates and cumulative percentages as abscissas. The groups in table 1 are arranged in the order of their medians and a glance shows that those groups with the lowest medians (toward the minus end of the scale) are the groups which one would expect to show mechanical inclinations. As the medians become higher (toward the plus end of the scale) the groups seem to become more and more socially inclined. Both the table and the graph show that this differentiation is quite marked between the mechanical group and the social group. The engineers form one definite group while the others form a consistently higher group. In spite of such marked differentiation, the distributions show a decidedly normal tendency.

In table 2 the groups are arranged again in order of their median scores with the most mechanically inclined toward the left, and the socially inclined toward the right. The table gives the numerical differences between medians, the probable error of these differences, and the significance of the differences. That is, the difference between the senior engineer

[2] In obtaining the medians for these groups and for all the work of this study, it was assumed that each score in units was at the midpoint of its "class-interval." Then the class intervals are −2.5 to −1.5, −1.5 to −0.5, −0.5 to +0.5, +0.5 to +1.5, etc. This procedure is justified by the theoretical consideration that all these scores are grouped evenly around the unit numbers. Since medians must have fractions in them, they are more nearly correct if it is assumed that scores are grouped around the mid-points of their intervals instead of around the beginnings of intervals.

[3] $\text{P.E.}_{\text{med}} = \frac{5\,\text{P.E.}_{\text{dis.}}}{4\sqrt{n}}$ $\quad \text{P.E.}_{\sigma} = \frac{0.6745\sigma}{\sqrt{2n}}$

TABLE 2

Median of each group, differences between the median of each group and that of every other group and the significance of those differences

	FRESHMAN ENGINEERS	FREYD ENGINEERS	JORDAN JUNIOR HIGH SCHOOL BOYS	JEFFERSON JUNIOR HIGH SCHOOL BOYS	MINNESOTA SENIOR ENGINEERS	NON-TWIN-CITY FRESHMEN	ALL FRESHMAN MEN	PRE-BUSINESS SOPH.	TWIN CITY FRESHMEN	SCIENCE, LITERATURE AND ARTS WOMEN	LAW STUDENTS	FREYD SALESMEN	
Medians	−3.0	−2.39	−2.19	−1.637	−1.27	0.2	0.81	1.16	1.59	2.3	2.7	3.42	
Freshman engineers		0.61	0.781	1.363	1.73	3.2	3.81	4.16	4.59	5.3	5.7	6.42	Difference between medians
		0.29	0.236	0.242	0.301	0.21	0.195	0.28	0.287	0.2503	0.276	0.206	P.E. of difference
		2.10	3.308	5.60	5.74	15.23	19.53	14.85	25.35	21.17	20.65	31.16	Significance of difference
Freyd engineers			0.171	0.753	1.12	2.59	3.2	3.55	3.98	4.69	5.09	5.81	Difference between medians
			0.316	0.321	0.367	0.3	0.289	0.35	0.278	0.327	0.348	0.295	P.E. of difference
			0.54	2.03	3.05	8.63	11.07	10.14	14.31	14.34	14.62	19.69	Significance of difference
Jordan Junior High School boys				0.553	0.949	2.419	3.029	3.35	3.809	4.519	4.919	5.639	Difference between medians
				0.270	0.324	0.246	0.232	0.307	0.218	0.278	0.302	0.24	P.E. of difference
				2.05	2.92	9.83	13.06	10.9	17.47	16.25	16.28	23.49	Significance of difference
Jefferson Junior High School boys					0.367	1.837	2.447	2.797	3.227	3.937	4.337	5.057	Difference between medians
					0.328	0.251	0.238	0.311	0.224	0.283	0.306	0.245	P.E. of difference
					1.11	7.32	10.28	8.99	14.40	13.91	14.17	20.64	Significance of difference
Minnesota senior engineers						1.47	2.08	2.43	2.86	3.57	3.97	4.69	Difference between medians
						0.308	0.297	0.36	0.287	0.334	0.354	0.303	P.E. of difference
						4.77	7.00	6.75	9.96	11.68	11.21	15.47	Significance of difference
Non-Twin-City freshmen							0.61	0.96	1.39	2.1	2.5	3.22	Difference between medians
							0.209	0.29	0.194	0.259	0.285	0.21	P.E. of difference
							2.91	3.31	7.16	8.18	8.77	15.33	Significance of difference
All freshman men								0.35	0.78	1.49	1.89	2.61	Difference between medians
								0.279	0.176	0.246	0.273	0.202	P.E. of difference
								1.25	4.43	6.05	6.92	12.92	Significance of difference
Pre-business sophomores									0.43	1.14	1.54	2.26	Difference between medians
									0.267	0.318	0.34	0.285	P.E. of difference
									1.61	3.58	4.53	7.93	Significance of difference
Twin City freshman men										0.71	1.11	1.83	Difference between medians
										0.233	0.26	0.18	P.E. of difference
										3.04	4.26	10.1	Significance of difference
Science, Literature and Arts freshman women											0.4	1.12	Difference between medians
											0.313	0.253	P.E. of difference
											1.28	4.42	Significance of difference
Law students												0.72	Difference between medians
												0.28	P.E. of difference
												2.57	Significance of difference

median and the median for Freyd's engineers is 1.12 units. The P.E.$_d$ is 0.367 and the significance of this difference is 3.05.[4] The differences at the left end of each row are usually insignificant, and toward the right, as a rule, they become more and more marked. Those at the left end of each row are differences between groups supposedly similar while nearer the right the groups compared are more and more dissimilar in mechanical and social inclinations.

From the data it appears that freshman engineers are significantly more mechanically inclined than arts, law, business or sales students. *The extent of this difference is shown by the fact that only 4.3 per cent of the freshman engineers reach or exceed the median of the law students and only 10.5 per cent of the law students score below the median of the freshman engineers.* The difference is even greater if the scores of the freshman engineers are compared with the sales students tested by Freyd. It is apparent that only the exceptional law or sales student makes a minus score and only the exceptional engineering student makes a plus score. Hence, one is justified in concluding that a plus score is indicative of strong social leanings and interests whereas a minus score is suggestive of mechanical interests. In proportion as an individual's score deviates in the plus or minus direction from the arbitrary algebraic zero of our interest scale, may his interests be accurately described as social or mechanical.

The freshman engineers seem more mechanically inclined than senior engineers graduating from the same university. This difference is noticeably smaller than in the other cases and yet is statistically significant. It may be due to the fact that senior engineers have broadened a little more in the course of their four years work and have become more interested in other people as well as in things. This might tend to make them have more plus items than the freshmen, and although they might have the same number of minus items their total scores would run higher. This is only a suggestion and has not been tested out. The Freyd engineers show no significant difference from Minnesota engineers, either freshmen or seniors. The Freyd engineer and our engineer groups are significantly more mechanically inclined than any of the S. L. A., law, business or sales groups, as one would expect. But the engineers as a whole are much alike. They are typically mechanically inclined according to our criterion.

The S. L. A. freshman men as a whole are much alike but one strange fact appears. There is a significant

[4] The significance of the difference is the ratio between the actual difference and the probable error of this difference.

$$\text{P.E.}_{\text{diff.}} = \sqrt{(\text{P.E.}_{\text{med.}_1})^2 +)\text{P.E.}_{\text{med.}_2})^2}$$

A ratio of 4 indicates that in one hundred trials out of a hundred the direction of difference will be the same in later experiments on similarly selected groups. For this ratio of 3.05, the chances are 98 out of 100 that the *direction* of difference will be so confirmed and therefore that the difference obtained between the two groups is a *real* difference. A table showing the chances that any ratio indicates a real difference may be found on page 78 in "Experiments in Psychology" by W. S. Foster.

difference between those who come from the Twin Cities and those who do not, the non-Twin City group being more mechanically inclined. Is this because those from outside come chiefly from farms and smaller communities and thus are more interested in mechanical things, or is it because they have had less chance to be with people and to form definitely social attitudes? There seems no obvious way of settling the question but there the difference stands. The pre-business students belong with the S. L. A. freshmen both in medians and in relations with other groups. Perhaps their interests are not definite enough to differentiate them from "just plain college students" or perhaps the definitely mechanically inclined and definitely socially inclined among them are nearly equal in number and therefore cancel each other's effect. This group includes those who will later specialize in analytical research work, accounting and finance, and who are presumably less socially inclined than those specializing in selling, advertising, merchandising, and executive and labor management. But these two divisions cannot be distinguished by Freyd's method. The distribution in the figure, for this group of students, is a normal curve with no tendency to bimodality. The two sorts of business students apparently are not different enough for the questionnaire to separate them into two modal groups. The S. L. A. freshman women seem to resemble law students very closely. The women are much more socially inclined than the S. L. A. non-Twin City men but not significantly more so than S. L. A. Twin City men. Neither are the women very much different from the pre-business students. Law students are significantly different from every one except the S. L. A. freshman women and the salesmen.

Freyd's group of salesmen are far different from the other groups; they are a more definitely distinguished group and show larger significant differences in every comparison. It would be interesting to have some sales students from the University of Minnesota who would presumably be drawn from the same general localities as the other Minnesota students.

TABLE 3

Comparisons of foreign-born students

	NUMBER OF CASES	MEDIANS	S.D.	P.E.
Engineers	21	−4.125	3.12	1.87
S. L. A.	24	+0.3	4.087	2.62

Difference between medians	4.425
P.E. of difference	0.672
Significance of difference	6.58

But in the case of engineers, Freyd's group was not radically different from the Minnesota engineers and it may be safely assumed that Freyd's group of salesmen is not much different from what Minnesota salesmen would be if there were such a group available for comparison.

Among the engineers and S. L. A. freshman men were a few foreign-born students. These are not included in the table since they were so few in number, but their medians and difference were computed for purposes of comparison. Table 3 shows the

results. Although the groups are so small that a greater actual difference between medians is less significant than is the difference among native-born students, still the tendency is the same, showing the engineers to be much more mechanically inclined than the S. L. A. men.

INVESTIGATION ON JUNIOR HIGH SCHOOL LEVEL

The Freyd questionnaires were also given to two groups of seventh grade junior high school boys. Jordan Junior High School is in an industrial center of Minneapolis and teaches sons of craftsmen and mechanics. Of 154 boys, only 6 have fathers who could by any possibility be classed as professional. In general, the boys themselves say they expect to be mechanics and engineers. Jefferson Junior High School is in a fashionable residential district and of 160 living fathers, 49 are in the professional class. In comparison with Jordan Junior High School a larger proportion of these boys expect to take up occupations having to do with people and social situations. The medians, distributions, and significance of differences for these two groups are given in tables 1 and 2 for comparison with the college data. One would expect the boys from Jordan Junior High School to be similar to engineers—mechanically inclined—and the table confirms this expectation. On the other hand the Jefferson Junior boys, from different surroundings, might be more socially inclined, but the table shows them almost as mechanically inclined as the Jordan Junior boys. They are not significantly different from any of the engineers except the group of freshmen from Minnesota.

The Jefferson Junior High School boys were given the blanks with the expectation that they would be significantly more socially inclined than the Jordan Junior High School boys. The fulfillment of this expectation would have supplied evidence for the hypothesis that the groups differentiated as mechanically inclined and socially inclined in college had also been different in interests as early as their junior high school days. This evidence would also have tended to corroborate Thorndike's results as to the permanence of interests from elementary school through college days (6). He obtained a correlation of +0.60 between the order of an individual's interests in college and the order of those interests as it was *remembered* from elementary school days. From this he argues that interests have astonishing permanence, even that they are among the most permanent features of one's personality. But the difference among the high school boys did not appear, both groups being noticeably mechanically inclined. But it is possible that among the Jefferson Junior boys, those whose fathers are professional will show a significantly higher plus score than will those whose fathers are not professional. The boys were divided on this basis; the sons of professional men obtained a median score of −1.0 while the sons of non-professional men obtained a median score of −2.22. The difference be-

tween these two proved to be statistically significant for the ratio between the difference and the probable error of the difference was 4.93. The boys were also divided into those whose fathers dealt primarily with things and those whose fathers dealt with people. The sons of those who dealt with people had a median score of −1.23 while the sons of those who dealt with things had a median score of −3.6. This difference proved to be less significant. The ratio was 3.26. Then it appears that there is a tendency for sons of professional men to be slightly more socially inclined than similarly selected sons of non-professional men. The question of whether the Jordan Junior boys, divided on the basis of professional and non-professional fathers, would have shown any difference, cannot be answered since the number of professional fathers was only 6 and therefore too small to have any statistical reliability. It is interesting, however, that the median score of these 6 boys was +3.0 while the median for the whole Jordan Junior group was −3.0. But if these groups are fair representations of groups of boys in general, and if the Freyd scale is a valid measure of direction of interest, then all boys of junior high school age are more interested in things than people—more mechanically inclined than socially inclined—a fact of the utmost importance in connection with the junior high school vocational training program.

However, the study of college students shows definite differences between groups—some men are strongly mechanically inclined, and some are very markedly socially inclined. How harmonize these two sets of facts? The boys in high school are not sorted by vocations, but by locality in the city. The men in college are sorted by vocational interests definite and decided enough to have led to the specific actions of enrolling in and pursuing certain lines of study. Do the facts warrant a belief in "interest types"? Group the college men together; consider all the distributions of table 1 as combined into one large group; and no bimodal or multimodal distribution appears. Hence, Freyd was quite right when he said this method would probably not distinguish types of people but would be useful chiefly in identifying individuals deviating markedly from the single type, represented by those neither strongly socially nor mechanically inclined.

QUESTION OF RELIABILITY

To test the reliability of answers to the questionnaire, the blanks filled out in February, 1925, by the business students were compared with those filled out in September, 1923. Only 67 of the whole 84 were available so the results of the comparison rest upon these. The answers made in 1925 correlate +0.446 with those made in 1923, a year and a half earlier. This year and a half was the first part of their college course and therefore possibly a period of changing attitudes. Of the 67 cases, 11 changed their scores up or down by 5 to 11 units, and these few would greatly reduce the correlation. So although at first glance the correlation seems low, it represents considerable sta-

bility of attitude, through a time when attitudes would seem liable to change. Also the small number of cases involved necessitates large reservations in the interpretation of this reliability coefficient.

But it is evident that one of the chief weaknesses of the present study and of all other work on Freyd's questionnaire reported to date, is the lack of a thorough-going analysis of the reliability or consistency of Freyd's scoring method. Lack of time and facilities prevented the writer from conducting experiments to show the reliability coefficients for each group answering the questionnaires, during a short time interval (a week) and during a longer time interval (a year). Reliability coefficients using the "odds versus evens" technique could have been utilized but they would have thrown light only on momentary stability of attitudes, and, too, this technique represents the least significant method of measuring reliability. Since the intention of this study is to make a preliminary exploration of group differences, with no attempt to apply the results to individuals, the weakness is not to be regarded as fatal to the main conclusions concerning the group differences.

SUMMARY

1. Groups of university students when selected on the basis of vocation are also selected on the basis of mechanical and social interests as measured by the Freyd scale. Those who plan to enter occupations dealing primarily with things (engineers) have significantly minus scores; those who plan to enter occupations dealing primarily with people (salesmen and lawyers) have significantly plus scores; and those whose occupations lie between these two extremes or who have not yet chosen a definite occupation, have intermediate scores.

2. These scores are significant, at the present time, primarily for group analyses—not for individual prognosis or specific vocational advice. The groups overlap to such an extent that in most cases an individual score could be placed in several groups. However, the extreme groups—engineers and law or sales students—are so definitely differentiated that an individual minus score, even though it be as low as −2, will designate its possessor as rather definitely mechanically inclined, certainly as not socially inclined. Individual scores outside the limits of −2 and +2 may be definitely labelled mechanical and social scores, since only 10 to 30 per cent of the social group are below −2 and only 5 to 20 per cent of the mechanical group are above +2.

3. Although the vocational groups are decidedly different in interests, yet a group of unselected college students would probably show no types.

4. Types are not present among junior high school boys. Even groups of boys who live in quite different environments show no significant differences as far as their scores are concerned. All show strong mechanical inclinations although as a group the sons of professional men tend to be slightly less mechanically inclined than the others.

5. In order to determine the relation between the interests of a boy in junior high school and his interests

when he reaches or finishes college, it will be necessary to obtain records of a large number of boys each year through high school and college. Such records would indicate the permanence or fluctuation of interests, the changes in direction and perhaps also the changes in degree or intensity. Until some such thorough study of the constancy of the interest score is carried to completion, the usefulness of the Freyd scores will be greatly limited especially when applied to individuals in adolescence. The marked differentiation of vocationally selected college student groups indicated in this study warrants further investigations in this direction.

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A Measure of Finger Dexterity

By Mildred Hines and Johnson O'Connor, *West Lynn, Massachusetts*

Johnson O'Connor is an engineer with keen appreciation of the human factor in production. He believes in measuring objectively the specific abilities of applicants for employment.[1] *With Miss Hines, he tells how one test or worksample was standardized in the West Lynn Works of the General Electric Company, and its usefulness demonstrated as an aid in selecting women for instrument assembly work.*

DURING the past three years, 1021 women applying for employment at the West Lynn Works of the General Electric Company have been given a test for finger dexterity. Apparatus for the test consists of three hundred brass pins and a flat plate, in which one hundred holes are drilled part way through. A candidate, using the right hand only, takes the pins from a tray in which they are piled loosely, and places three in each drilled hole as rapidly as possible. Individuals differ widely, the fastest finishing in less than six minutes, while the slowest require from twelve to fifteen minutes.

SPECIFICATIONS FOR APPARATUS

Use three hundred brass pins, 0.072 inch in diameter and 1 inch in length; and a metal plate $\frac{7}{8}$ inch in thickness, $5\frac{3}{4}$ inches wide, by 12 inches long. In one-half of the plate drill one hundred holes, arranged in ten lines of ten each, $\frac{1}{2}$ inch apart both ways, depth of holes, $\frac{3}{4}$ inch, diameter of holes, 0.196 inch (No. 9 drill). The other half of the plate consists of a shallow tray approximately 5 by 6 inches with gently sloping sides so that the pins cannot be lifted by gathering them against the side of the tray.

DIRECTIONS

Show candidate the pin board with three hundred pins assembled, three in each hole. "There are three pins in each hole. I will tip them all out and get you to put them back, three in each hole, as fast as you can. Use only your right hand. Try to pick them up three at a time because you cannot go fast enough taking them one by one." Allow candidate to place thirty pins, thus filling ten holes for practice. Tip out these thirty again, allow a moment's rest, and then time accurately with a stop watch in minutes and hundredths the time required from placing the first pin to the last. If either two or four pins are assembled by mistake in one or two of the holes, do not count against the candidate, and if because of such a mistake two

[1] Johnson O'Connor—*A Scientific Method of Selecting Employees*, Monogram (General Electric Company), November, 1925.

or three pins are left over at the end do not require the subject to find where these pins belong and assemble them. The test measures finger dexterity, not accuracy in counting.

CORRELATION OF FIRST AND SECOND SCORES

The Pearson coefficient of correlation between the first and second scores, based on fifty-six persons who repeated the test, is 0.60. All tests were given under employment conditions. In several cases from one to two years elapsed between trials, and in others the mental attitude of the subject changed. Some, at the first attempt, manifested little interest but on finding that employment was impossible without an A grade, entered into the second effort with determination. The physical condition of the finger nails must also affect the score, although the amount has not yet been determined. Thus, a correlation of 0.60 is comparatively high.

Performance improves with repetition. The average second score multiplied by 1.05 equals the average first. Multiply, therefore, the time of the second trial by 1.05 in order to use the same norms. From the second to the fifth repetition there is only slight further improvement.

NORMS

Women perform the test better than men, and years of factory experience show that women are more satisfactory than men on this type of small work.

The percentiles based on one thousand and twenty-one women and one hundred and fifty-eight men are:

	WOMEN	MEN
	minutes	*minutes*
Fastest speed	5.70	5.70
25 percentile	7.10	7.70
50 percentile (median)	7.70	8.30
75 percentile	8.30	9.00
Slowest time	More than 15	More than 15

Fifty-eight per cent making good are in the first quartile, 27 per cent in the second, 12 per cent in the third, and 3 per cent in the fourth.

EMPLOYER GRADING VERSUS TEST SCORES

A criticism, often heard in discussions of test results—that the trained employer can sort good and poor applicants as accurately as any test—is directly susceptible to experimental proof. Thirty-six girls were interviewed by a trained employer, graded either A, B, C or D, based on personal opinion, and hired. The same girls, independent of this estimate, were measured on the three-pin test. Of those who were in the fourth quartile in the test, 36 per cent left within eight months' time. Not one of these was graded D by the interviewer. All who subsequently left had been graded A by the interviewer. In other words, the test selected fairly accurately that group of persons so unfitted for small assembly work that they left within eight months; whereas the personal interview was incapable of giving this same information. Of those in the first quartile in the test, only 6 per cent left during the first eight months; whereas of those graded A by the interviewer, over 50 per cent left during this same period.

TABLE 1

Detailed distribution of 1021 women who took the worksample, and of 77 of these women engaged in fine meter or instrument work.

Quartiles are based on the 1021 cases

	TIME	DISTRIBUTION OF 1021 WOMEN	DISTRIBUTION OF 77 WOMEN		
			Successes at fine work	Failures at fine work	Terminations all causes including failures
First quartile	5.71–5.80	2			
	5.81–5.90	2	1		
	5.91–6.00	4	1		
	6.01–6.10	12	2		1
	6.11–6.20	9	2		
	6.21–6.30	16	1		
	6.31–6.40	23	2		
	6.41–6.50	23	2		
	6.51–6.60	19	2		
	6.61–6.70	20	5		1
	6.71–6.80	29	3		2
	6.81–6.90	28	4		
	6.91–7.00	43	7		1
	7.01–7.10	46	3		
Second quartile	7.11–7.20	48	5		
	7.21–7.30	73	4		
	7.31–7.40	35	1		
	7.41–7.50	36	5		
	7.51–7.60	30			1
	7.61–7.70	26	1		1
Third quartile	7.71–7.80	46	3	1	1
	7.81–7.90	52	2		2
	7.91–8.00	48	1		
	8.01–8.10	36	1	1	1
	8.11–8.20	32			
	8.21–8.30	32		2	3
Fourth quartile	8.31–8.40	23			
	8.41–8.50	22			
	8.51–8.60	17			
	8.61–8.70	17	1	1	1
	8.71–8.80	12			1
	8.81–8.90	16	1		
	8.91–9.00	21			
	9.01–9.10	13			
	9.10–9.20	10			
Fourth quartile (Continued)	9.21–9.30	14			
	9.31–9.40	6			
	9.41–9.50	17			
	9.51–9.60	5			
	9.61–9.70	9			
	9.71–9.80	8			
	9.81 or more	41		1	1
Total		1,021	60	6	17

TABLE 2

Scores of 77 women engaged in fine meter or instrument work

QUARTILES BASED ON 1021 CASES	SCORES	SUCCESSES AT ACTUAL WORK	FAILURES AT ACTUAL WORK	TERMINATIONS INCLUDING FAILURES
		per cent	*per cent*	*per cent*
1	0–7.10	88	0	12
2	7.11–7.70	89	0	11
3	7.71–8.30	50	29	50
4	8.31 or more	40	40	60

Regardless of whether or not one believes in tests of this character, the employment manager who has among his selections no failures and 11 to 12 per cent leaving, is more successful than one with 28 to 40 per cent failures, and 50 to 60 per cent leaving. This result can be accomplished by selecting applicants who score above the median in such a test as this.

DETERMINING VALUE OF TEST

Since the inauguration of this test, seventy-seven new women workers

have been assigned to fine meter or instrument work requiring finger dexterity. Subsequent follow-up shows them to form three groups: sixty who proved satisfactory; six who failed; and eleven who left before either succeeding or failing. The object of an employment office should be to hire none of the failures, as few as possible of those who leave within a short time, and as many as possible of the successful workers. All of those who failed required, before they were employed, more than 7.70 minutes to pick up and place the three hundred pins, while 85 per cent of the ultimately satisfactory ones assembled the pins in less than this median time. If only candidates performing the test in less than 7.70 minutes had been hired for fine work, none would have failed to make good, and 85 per cent of the desirable ones would have been hired. Nearly every employer can afford to turn away 15 per cent of those who would make good, if by so doing he eliminates all failures.

(Manuscript received October 1, 1925.)

The Work of Personnel Research Federation

Annual Report of the Director at the Business Meeting of Corporate Members, October 16, 1925

By W. V. Bingham

PERSONNEL Research Federation is exactly what its name implies. It is a *federation* of research bureaus, government agencies, university departments, business concerns and individuals with one common purpose. That purpose is to advance research on problems affecting workers in relation to their work. In the words of our charter, the object of Personnel Research Federation is "the scientific study of man in relation to his occupations and his education therefor." We exist for the furtherance of *personnel* research.

This is a broad territory. Wherever men and women work, wherever young people are in training for their life careers, problems of personnel appear. Wherever agencies are trying to solve these problems in the spirit and with the methods of science Personnel Research Federation lends its help. It was established to chart research activities in progress, keep research workers informed of each other's activities, help avoid duplication of effort and encourage new research where need is greatest. It publishes results of research. It organizes formal and informal conferences and carries on correspondence to bring about coöperation in research projects. It acts as sponsor for research grants. Within the fields of industrial, educational and governmental personnel it serves as the clearing house and the coördinating center for research.

RANGE OF PROBLEMS

Personnel management in business or education has to do with the adjustment of individuals in relation to their occupations. Its watchword is "The right man in the right place." Usually its initial task is job analysis, to get a clear and precise statement of just what the duties of an occupation or a profession are. Sometimes the problem is essentially one of selection: choosing the right applicant for the job, or helping the applicant select the right job or career. Often the personnel problem becomes one of education in school or college, or of special training: how best to develop the skill or knowledge or personal qualities known to be required for success. At other times the problem is one of motives and incentives: how

management can best secure wholehearted coöperation and maximum intelligent effort of employees. Again, the personnel problem focuses on conditions of work, asking how fatigue can be reduced, irritations removed, health insured, accidents forestalled. Not infrequently it is recognized that the personnel problem strikes deep into the fundamental organization of business and production, asking, for example, how the spectre of seasonal or occasional unemployment may be banished. Economics, medicine, physiology, psychology and engineering must each contribute toward answering these questions. Only so will the business administrator and the man of science do their share toward making the modern world of industry and commerce a more satisfying place for men to work.

FUNCTION OF THE FEDERATION

To hasten the approach toward this broad objective, Personnel Research Federation was founded in 1921 by the National Research Council and the Engineering Foundation. It consists today of 28 federated organizations, each bringing to bear the methods and ideals of science on one or more segments of the total area of personnel research. Through the medium of the Federation they are striving to multiply the effectiveness of their efforts by harmonizing their programs, minimizing duplication and bringing to view neglected phases of research. They are pledged to work toward a comprehensive plan, through which research activities may be correlated and in accordance with which future work may most effectively develop.

During recent months the central office of the Federation has been building up a staff which today includes a director, a field representative, a research assistant, a librarian and editorial assistant, and an office secretary. Since the first of May we have had our own quarters in the American Radiator Building at 40 West Fortieth Street, New York. This office, easily accessible, is coming more and more to serve as the meeting place for workers in personnel research and as a clearing house for pertinent information.

One year ago the Personnel Research Federation discussed a program of work outlined under the four main headings of Information Service, Promotion, Planning, and Conduct of Research. This outline will be followed in summarizing briefly the accomplishments of the past twelve months; and in the light of this year's experience, a few modifications of the program will be suggested. The program of work, as restated, is as follows:

PROGRAM OF WORK

Information Service

1. Continuance of the JOURNAL OF PERSONNEL RESEARCH as the official organ for publication of results of investigations.

2. Exchange among members of the Federation of available research information, bibliographies, forms and other aids. Preparation of index of sources of information about research on questions of industrial fatigue and industrial hygiene, including mental hygiene and the effects of rest pauses; selection and development of executives; hiring, placement and training of workers; industrial relations, including shop committee plans and other provision for coöperation of workers in management;

methods of wage payment; non-financial incentives and rewards; job analyses and personnel specifications; personnel records and forms; rating employees; methods of personnel administration, vocational guidance and placement in colleges and schools; and other live topics of personnel research.

3. Discovery and collection of unpublished reports and notes of research on which data are often buried in the files of business concerns, trade associations, labor organizations, government bureaus and university departments.

4. Re-writing the results of research published in technical scientific journals, to make them available for workers, business men and general readers.

5. Preparation of manuals of procedure or guides for the research worker.

Promotion

6. Promotion of interest in the purposes of the Federation through group conferences, occasional articles in the public press, service bulletins, addresses, attendance at meetings, correspondence and personal interviews. Securing support of business houses and foundations for specific projects.

Planning

7. Inventory of current researches, research facilities and available workers. Survey of outstanding problems, their relative importance, feasibility and likelihood of commanding support. Planning in detail for selected projects involving cooperative effort.

8. Helping member organizations to further their research by furnishing the counsel of the Staff and Technical Advisers, in formulating definite problems, developing suitable research techniques, finding competent trained investigators, and securing adequate facilities and financial support.

Conduct of Research

9. Investigation by the Staff, as opportunity presents, of such problems as: Selection and development of supervisors and minor executives; relation of general ability to stability of employment; occupational opportunities.

JOURNAL OF PERSONNEL RESEARCH

As a center for the exchange of research information the office of the Personnel Research Federation has been functioning both by correspondence and by personal interview. Our chief service as a clearing-house, however, is performed through our official publication, the JOURNAL OF PERSONNEL RESEARCH. The JOURNAL is now in its fourth volume. Volume 3 contained 34 major articles and original studies, 46 book reviews, and 121 abstracts of investigations reported elsewhere. The news notes appearing month by month have kept readers informed not only of what our own corporate member organizations were accomplishing, but also of significant personnel activities wherever they have occurred. Among the leading articles have been such diverse topics as:

Women in Banking
Graphic Labor Control
Modern Ventilation Principles and their Application to Industrial and Sedentary Life
The Study of Fatigue
Selecting Retail Saleswomen
Industrial Accident Prevention as a Personnel Problem
Efficiency Tests of Pennsylvania Railroad Personnel
A Project of Investigation and Development in the Field of Engineering Education
Student Personnel Service at Minnesota

In the effort to locate all material suitable for abstracting, about 75 periodicals are searched regularly.

LIBRARY

The number of books in the central office of the Federation is small as

yet, but we have many current journals, reprints, and pamphlets. We also have the nucleus of a collection of unpublished reports and notes on current researches. It is the plan to collect and catalogue research studies, reports and investigations, and, if the actual study is not at hand, to have on file information as to where it may be obtained. One step has been in the collection of bibliographies, the most conspicuous being "A Bibliography on Vocational Guidance in College," prepared by Lewis A. Maverick while a graduate student at Harvard, which contains more than 350 references; and the "Bibliography on Psychological Tests and Other Objective Measures in Industrial Personnel," by Dr. Grace E. Manson of the University of Michigan.[1]

For sources of information about personnel research frequent use is made of the United States Bureau of Labor Statistics Bulletin No. 299 entitled "Personnel Research Agencies," compiled in accordance with a resolution adopted at the first conference on personnel research held under the auspices of the Engineering Foundation and the National Research Council, whose deliberations resulted in the organization of the Personnel Research Federation.

CONTACT WORK

Through correspondence and visits of its Field Representative the central office aims to keep in personal touch with the work of members of the Federation and other research agencies. Dr. Paul S. Achilles who acts in this capacity and who edits the Service Bulletins, presents the following brief statement of his duties:

> It is because *coöperation* between actively interested agencies makes for better progress in the furtherance of personnel research that this Federation was formed, and that the organizations and individuals concerned are being brought into closer and more helpful contact with each other, and with other agencies at work in this broad area. There is danger of forgetting that the Federation is something far larger than the office and staff localized here. When asked what the Federation is doing, our answer must be first in terms of what the member organizations are doing with their facilities for research. Our aim is to assist in as many ways as we can. At the same time we shall often call upon the members for reports and advice, and for exchange of opinions and data.
>
> To facilitate coöperation and to find out what you and others are doing in the way of research is a part of my job, which may best be designated as contact work. I saw a game the other day that I shall use for illustration. There was a rather long box with about thirty little metal pegs sticking up out of it, and sets of cards with holes punched in them to fit over the pegs. On the left side of each card, questions were printed at the points where the pegs came through, and on the right side, answers. A bit of insulated wire with a socket on one end and a metal pointer on the other goes with the outfit. You place the socket over a question peg and then set out to touch with the pointer the peg that gives the correct answer to that question. If you touch the right peg a contact is formed that rings a buzzer. If not, nothing happens and you try some other peg. Your score is in terms of the number of failures before you get the right answer to each question.
>
> I can draw two analogies from this game. One is that as "contact man" I try to serve as the wire that connects questions with answers, or rather with sources for answers,

[1] Dr. Manson's bibliography of 600 titles was published in the November-December issue of the JOURNAL OF PERSONNEL RESEARCH.

since there are few answers ready-made. It is through long continued research that answers are gradually being accumulated. Note that the function of the wire is to make the connection, not to serve as an encyclopedia. When you present a question we try to connect you with the pegs most likely to give you a buzz in response.

The second analogy is that the members of the Federation and other similar agencies are in a sense the pegs in the game. If there is something doing at each peg there will be a buzz when the connecting wire brings it the right sort of question. There should be today, for example, a good live buzz from every peg present. The more each member knows about what the other members are doing and how they are doing it, the better.

We are feeling our way carefully in making contacts with business firms and other research agencies, suggesting possibilities, finding what they are interested in and how we may be of service to them, and the best means of enlisting their further coöperation. More inquiries are beginning to come our way and at the same time our lines of procedure in rendering distinctive services not readily available elsewhere are becoming clearer. Our Service Bulletins[1] have been useful in introducing us in many places. Some 2200 copies of Bulletin No. 3, Directory of Placement Services in American Colleges and Universities, have been distributed. I shall appreciate suggestions for further Bulletins, as well as for other means of making new contacts and friends for the Federation.

[1] *Service Bulletin No. 1*, Issues in Research Method: Outline of a paper on procedure followed in studying the industrial representation plan of the Colorado Fuel & Iron Co. A report to Personnel Research Federation, by Mary Van Kleeck. 10 pages, May 15, 1925.

Service Bulletin No. 2, College Personnel Research, Summaries of progress, 1925. Condensed reports of current activities in personnel research and vocational guidance service from 24 institutions. 38 pages, May 22, 1925.

Service Bulletin No. 3, Directory of Placement Services in American Colleges and Universities. 4 pages, July 7, 1925, reprinted August 17, 1925.

MANUALS OF RESEARCH PROCEDURE

This paragraph of our program refers to a difficult but important aspect of our work: the encouragement of sound research by making readily available clear statements of the best procedures and techniques. It is wasteful in the extreme when investigations are carried on in industry or elsewhere without adherence to dependable statistical standards and valid scientific procedures. The results are bound to be disappointing or misleading. To help investigators plan their work and carry it to a successful end, we plan to issue from time to time guides to research procedure. Already Dr. Freyd and I have completed the first draft of a manual for investigators in the field of vocational selection. We expect to publish it within the year. Such a manual will not only be a convenience to research workers in graduate schools and in industry; it will serve to make results more readily comparable, through use of comparable methods and standards of investigation.

CONFERENCES ON METHODS OF RESEARCH

In May we held two conferences in Washington. One was on Methods of Research in Industrial Relations, and the other on Vocational Guidance in the Colleges. These conferences have been described fully in the August-September JOURNAL OF PERSONNEL RESEARCH. They represent one of the definite accomplishments

of the year, particularly in so far as they focused attention on methods of research—on the necessity of improving the ways an investigator uses to get at the truth about a problem involving the elusive human element. The methods used by the Russell Sage Foundation in its investigation of the Rockefeller plan of industrial representation in the Colorado Fuel and Iron Company were presented most illuminatingly by Miss Mary Van Kleeck and examined with penetrating and constructive criticism by economists, psychologists, industrial relations counselors and labor leaders. In following up this conference on Industrial Relations Research Methods, we are expecting to hold during the winter several informal meetings at which investigators of labor and industrial relations problems will present for criticism the methods used in current or proposed researches.

PLANNING

The work of detailed planning of research programs and outlining procedures on specific projects is an activity in which the staff of the Federation engages only on request. Neither the Federation nor its representatives would attempt to impose their suggestions. But requests have been frequent during the past year, not only from member organizations but from graduate students planning their dissertations, and from other non-member investigators, including three business concerns. In each instance we have coöperated, so far as limitations of time permitted, in laying out procedures for the research in question.

THE FUTURE

No report is complete without a statement of what has not been accomplished, nor as yet begun. We have nothing to show under paragraph four, the re-writing of the results of important researches in terms readily understandable by the general reader. Requests for such materials have come from the Workers' Education Bureau and the American Federation of Labor. We can point as yet to no specific accomplishment under the last sections of paragraph six and paragraph eight, securing financial support for specific projects. Under paragraph nine, we have completed no original researches conducted by the staff. So much for what we have not done. For these omissions we point to the short roster of the staff and to the limits of the working day. We do not believe the Program of Work should be modified in these regards. On the contrary, these items are most important. They should be stressed, and brought home to corporate members and to thoughtful business executives until they see the wisdom of investing the sums needed to enlarge the staff.

I would like to discuss with you the possibilities of coöperative research bearing on employee participation in management, and the shop-committee plan in relation to the trade-union. Issues of profound importance are defining themselves in the minds of thoughtful employers and labor leaders. Can and should the shop-committee plan be extended beyond the confines of a single plant or concern, in a way to conserve to workers and industry the advantages of collective

bargaining? Or can the organized labor movement incorporate in its practices the best of the shop-committee principles, as they seem to be doing in the Baltimore and Ohio shops? Research on aspects of this topic may well engage the best efforts of some of our member oganizations.

The effect of rest pauses in relation to workers' efficiency and satisfaction on the job, is a problem that promises important returns from coöperative research.

The research topics cited under paragraph nine have been chosen as representative of three types of problem. Each of them can best be attacked by joint coöperation of several industrial or business concerns; but they differ in complexity and difficulty. "To determine the best methods of selecting and developing young men to be managers, supervisors or minor executives" is a practicable problem, but one that calls for careful analysis, shrewd experimentation and systematic follow-up for a period of years. It is, nevertheless, a problem in which many concerns are interested, and in the solution of which, even in part, they see large returns. Such an investigation should be inaugurated soon. It will cost approximately $10,000 a year.

The second topic is one whose importance is less widely recognized, but its significance is plain to students of labor turnover and causes of industrial unrest. "The relation of a worker's general ability to stability of employment in a particular sort of job" is not a simple positive correlation. It makes a great difference how much ability the job really demands—how rewarding the worker finds it in the satisfactions of accomplishment, as well as in the size of the pay envelope. Several investigators have found instances where on certain types of work the less able fraction of the employees have proved on the whole to be the more stable and satisfactory workers, content where brighter men were dissatisfied. A study in which several industries coöperate would reveal facts of profound economic, social and educational importance as to the demands and satisfactions of various types of work, for workers of various levels of general ability. The techniques for such a study are at hand. Its cost would be perhaps half that of the project previously mentioned.

An investigation of "occupational opportunities" requires no elaborate scientific technique. It can be limited in scope, or it can be indefinitely comprehensive. We propose to make a modest beginning by compiling, for use of college placement offices, a directory of the larger employers of college graduates, with statements of their requirements. In compiling the list of employers we shall count on the help of the placement offices of all the universities coöperating with the Federation.

One reason for proposing this project is that there is a definite demand for it. Another reason is, that in so doing we shall be aiding the development of effective placement services, and this is the best entering wedge for personnel work in colleges. As placement becomes well organized the demand takes shape for better, fuller information about the occupations and

careers open to college men and women. Then, as the facts become known about the occupations, as well as the abilities and personal qualities needed for success in them, the groundwork is laid for real vocational counseling. What started as a job-getting office becomes a bureau that reaches back and touches vitally the students' decisions as to choice of studies, character of work, and personal development. It comes at length to have a potent influence on educational policies, content of instruction, and the whole process of moulding the ambitions, intellectual life and character-development of the students. Does this seem a fantastically large outgrowth of a tiny seed? Then look at the facts. Look at the place and influence of the personnel department in Northwestern University. Look at Dartmouth College. Look at recent developments at Columbia, Harvard, Yale, Minnesota, North Carolina, Stanford, Ohio and Michigan. See how the college women blazed the way for this movement through their Association of Collegiate Alumnae. One cannot attempt to wrestle seriously with the matter of helping young people find employment without discovering that he has thrown open the gateway to the whole personnel program.

So too in industry. Starting with the old slogan, "the right man in the right place," the conscientious executive cannot stop short of a comprehensive scheme of management in which the human factor is accorded the same constant and thorough study that is lavished upon questions of design, materials, processes of manufacture, inventory control, cost accounting, or finance. Each investigation, carried through in the spirit and with the methods of science, not only meets an immediate need but also opens a vista of further developments, each contributing to productive efficiency, to satisfactions of men in their work and to better adjustment of human labor, industry and life.

The Personnel Research Federation exists for the furtherance of this more fundamental study of the human factor.

Effect of Scholarships

A Study in Motivation

By Albert Beecher Crawford, *Yale University*

Grants of scholarship aid at Yale vary in amount with achievement in scholarship. This has given Mr. Crawford, Director of the Yale Bureau of Appointments, an excellent opportunity to measure the effects of this sort of motivation.[1] *He compares the achievements of men receiving aid with the achievements of comparable groups of equally intelligent and well-prepared but well-to-do students who are able to meet their tuition expenses without such financial assistance.*

AS NEVER before students of limited means are crowding our colleges. One of the natural corollaries of this situation is an increased demand upon the institutions for scholarships, tuition remissions, and other forms of financial aid. Does the greater diligence of these students offset the distractions incident to their financial difficulties? Is the investment made in them justified by their scholastic achievements? The purpose of this investigation is to throw light upon these questions. At the same time an opportunity is presented to compare the correlations between intelligence and scholastic standing for two groups differentiated in respect to motivation.

What are the relative advantages and disadvantages of student self-support? The student working his way is usually diligent, otherwise he would not undertake the double enterprise of working and studying at the same time. But this duplicity of function has its accompanying hazard; his working activities may take so much time and energy as seriously to hamper his scholastic achievement. Extra-curriculum activities may be just as detrimental to scholarship when enforced by financial need as when prompted by athletic interest or social ambition.

It is generally held that the predictability of scholastic standing from intelligence ratings is, even for a test of high validity and reliability, uncertain because of the great variations in curricular effort. Motivation to obtain the best score possible in a single intelligence test is almost certainly greater for any group of students, than is motivation to main-

[1] The statistical data here presented are condensed from tables in the author's M.A. Dissertation, "The Motivating Effect of Scholarship Aid," a manuscript similar to the present article, on file in the Yale University Library.

tain, over a continued period, the highest possible level of classroom work. Definite quantitative evidence has been sought with reference to the assumption that markedly higher correlation would follow uniformity of scholastic application, and that intelligence ratings would have accordingly greater predictive value with reference to scholastic achievement, if higher and more equal motivation could be assured.

PREVIOUS INVESTIGATION

Despite the attention given to mental tests and their application to educational problems, but little previous investigation along these particular lines seems to have been undertaken. Various studies of correlation between mental tests and college grades indicate that coefficients of +.35 to +.50 may be considered normal. Bridges[2] regards the lower limit as somewhat more typical than the higher and attributes this relatively low relationship in part to the intellectual homogeneity characteristic of so highly selected a group as college students. Jordan[3] in his valuable analysis of the validity of standard tests found an average correlation of +.47 between college grades and mental ratings (Alpha, Miller, Otis and Terman). With regard to the effect of motivation upon such correlations some previous work has been done, but the assumed spurs to higher efforts studied in the present paper are probably more powerful than those investigated previously by others. Burtt and Arps[4] found higher correlation between Army Alpha scores and academic grades for students in military academies than for those in high schools—presumably because of better methods of professional instruction, and because professional studies provide more direct incentive for classroom effort than do more general subjects. Neither correlation was high but a coefficient of +.39 for the military students and of only +.19 for the high school students probably evidences a significant difference tending to substantiate the theory that motivation is an important factor in determining the degree of such a relationship.

May[5] found the two most important factors contributing to reliable prediction of academic success to be intelligence and application. The correlation between intelligence (as measured by a combination of the Miller and Dartmouth tests) and honor points in the first semester, for 450 Arts Freshmen was +.69. Partial correlation raised this coefficient to +.805 when hours per week of study were constant. Intelligence and hours per week study showed the

[2] Bridges, J. W. *The Value of Intelligence Tests in Universities.* School and Society, March 18, 1922, Vol. 15, pp. 295–302.

[3] Jordan, A. M. *The Validation of Intelligence Tests.* Jour. of Educational Psychology, Vol. 14, No. 6, pp. 348–366 and No. 7, pp. 414–428.

[4] Burtt, H. E., and G. F. Arps. *Correlation of Army Alpha Intelligence Tests with Academic Grades in High School and Military Academies.* Journal of Applied Psychology, December, 1920, Vol. 4, pp. 289–293.

[5] May, M. A. *Predicting Academic Success.* Jour. of Educational Psychology, Vol. 14, No. 7, pp. 429–440.

significant negative correlation of −.35. Assuming the data as to hours of study per week to be a reliable index of academic effort, it is apparent that constancy of application very markedly enhances the predictability of academic success from intelligence ratings. May seems not to have studied the causes of such incentive but only its effect. Laird[6] investigated several assumed factors in the disparity between mental ratings and grades in a small college. The correlation for his control group of 33 students for whom these factors were relatively constant was +.487. For students working their way entirely it was .00 and for those earning only their board, +.53. The latter coefficient was the highest for the sub-groups he investigated. His numbers were unfortunately too small to afford high reliability.

No study similar to the following has been made of the scholastic records of large groups of students working their way, as compared with those of their fellows in easier financial circumstances but otherwise undifferentiated. Therefore there are no previously existing data with which the writer's findings can be directly compared. In so far as any elements of the present study have been touched upon in the works cited above, however, there appears to be substantial agreement between the present and preceding investigations.

[6] Laird, D. A. *A Study of Some Factors Causing a Disparity Between Intelligence and Scholarship in College Students.* School and Society, Vol. 19, No. 480, pp. 290–292.

SCHOLARSHIP AID AS A MOTIVATION FACTOR

The system of scholarship awards at Yale University appears to furnish an opportunity for studying the effect of rather unusually potent motivation upon sufficiently large groups of students to yield reliable data. The first step of this investigation was to determine upon a method of selecting two properly comparable, large groups of students who differed in no other significant respect than such motivation, attributable at least in part to the system of scholarship aid already referred to.

Tuition scholarship awards at Yale are made on the basis of students' character and general promise, scholastic ability and financial need; all initial awards, for the first term of Freshman Year, are for the same amount—80 per cent of the tuition charge. Thereafter the stipends are determined for each term by the students' college grades in the preceding term, as follows: To those students attaining a general scholastic average of A (90 or better on a scale of 100—first honors), full tuition, $150.00 a term; to those attaining an average of B (80–89—second honors) 80 per cent of tuition, $120.00 a term; to those attaining an average of C (70–79) 60 per cent of tuition, $90.00 a term. Seventy is the minimum grade qualifying a student for scholarship aid, 60 is the passing mark, and 75 constitutes a "quality credit" in any course. Such tuition aid is extended only to students earning a substantial part of their own expenses.

It is evident that in the case of the self-supporting student this method of grading his financial assistance in accord with his scholastic achievements, provides a definite motivation factor. The writer's experience over several years with many such students has convinced him that this factor affects the grades of such students sufficiently to provide opportunity for the study of special motivation effects. Re-award of tuition scholarships and readjustment of the stipends at the beginning of each semester maintain this motivation continuously.

COMPOSITION OF GROUPS STUDIED

Various reasons based on experience with self-supporting students led to selection as the most representative sample of the specially motivated group, *those students in the Freshman Class who applied for scholarship aid upon entrance.* The entire number of students registered for self-support would be too large to permit of such a study and would include some men not seriously in need of financial help. At the same time the group chosen was large enough to secure reliability. The Freshman Scholarship *applicants* were chosen rather than the Freshman Scholarship recipients, in order to secure larger numbers to work with and also to insure a group as unselected as possible on the basis of previous scholastic achievement. Lists embracing all such scholarship applicants were made up before either their intelligence ratings or subsequent grades were investigated. A few foreign students whose test scores, because of language difficulties, were not a fair index of their mental capacities were eliminated. To insure greater reliability, the records of three different classes were investigated.

The next question was to secure a group of students not specifically motivated in this way, but otherwise comparable with the group of scholarship applicants. The regular Freshman mental test ratings were made the basis of comparison as to intellectual potentiality. As the validity of such a basis of equality might otherwise be debatable, certain other comparisons between the two groups in question were made to substantiate the major premise of their comparability, intellectually speaking, in all essential respects other than that of the specific motivation investigated.

The Anderson Intelligence test, upon which was based the pairing of students in order to form two comparable groups, is composed of the following elements: The test for the Class of 1925 consisted of two equivalent forms, each comprising four parts: test 1, arithmetic (25 items); test 2, synonym-antonym (80 items); test 3, sentence completion, with alternatives printed (40 items); test 4 information (40 items). The second form composed of four similar parts was given following form 1, with an interval between. The total time allowed, exclusive of instructions, was 32 minutes, 16 for each form. The Class of 1926 was given one form of the above test, in 16 minutes; followed by a reasoning test modeled after those of C. Burt and consisting of 26 items for which 20 minutes was allowed, making a total time of 36 minutes for the entire test. The

first half of the test given the Class of 1927 also consisted of one of the above forms originally designed for 1925 for which 16 minutes was allowed; followed by another test in three parts; 1, reasoning (13 items) 7 minutes; 2, pictorial form board test (18 items) 3 minutes; 3, information (50 items) 8 minutes; total time 34 minutes.

MENTAL TEST PAIRINGS

The two groups to be compared were made up as follows: The list of scholarship applicants for each year was compiled as stated and each applicant's score on the mental test was then obtained through the courtesy of Professor John E. Anderson of the Department of Psychology. From the rest of that applicant's college class another (non self-supporting) student with equal intelligence rating was selected at random. Thus paired lists of students equal on the basis of mental test scores were obtained for each of the three classes. There were 184 pairs for the Class of 1925, 186 for the Class of 1926, and 204 for the Class of 1927, the total number of Freshmen taking the tests being 816, 829, and 820 respectively. The mental pairing was, in the majority of cases, made on identical scores; in extreme cases identity could not always be secured but the size of the classes permitted very close correspondence in meeting even the extreme cases.

Thus we obtain for each of the three college classes two large groups of students whose intellectual potentialities as measured by the tests described, evidently are practically identical. These groups in each year will, for convenience, hereafter be designated as *scholarship* and *non-scholarship* respectively.

No doubt the question may be raised as to just what such a test as that upon which the mental pairings of our contrasted groups is based, really measures. Is it a valid test of intelligence or an index of past school learning or both? How reliable is a test of such relatively short duration, not repeated? Whatever answer, if any, is given to such queries, it seems evident that some combinations of traits are measured by these tests and that there is a definite positive relation between such traits and scholastic achievement. Furthermore any observable differences between groups paired with respect to test scores *in three successive classes* would certainly not be enhanced by any factors of unreliability possibly inherent in the test themselves; for if the same tendencies and relations appear with respect to three different classes, such findings are mutually corroborative.

After completion of the pairings the average scholastic grade in The Freshman Year for each individual was ascertained. In the case of students not completing the year, grades were taken for as long a period as possible. The grades of the two groups were then compared in different ways. Before discussing the results of such comparison, it would be well to consider the validity of the sampling by comparing the groups with the classes as a whole.

Obviously the two groups by reason

of pairing, are, in intelligence ratings, practically identical. Comparison in table 1 of the mean and the σ for either group in intelligence, with the mean for the whole class, gives in each case so close a correspondence as to show clearly that each group adequately represents the intelligence level of its class and distributes itself about this intelligence mean just as the entire class does. It will be noted that the test scores for the different years were differently scaled. Complete distribution tables both of intelligence ratings for the entire classes, and for the non-scholarship and scholarship groups investigated are given in the original article on file in the Yale University Library.

TABLE 1

Mental ratings of Yale Freshmen applying for scholarship aid at entrance and of non-self-supporting classmates paired with them on the basis of such ratings. Data for these paired groups show, when compared with similar figures for their respective entire classes, that the groups are representative samples of the classes as a whole.

	1925			1926			1927		
	Scholarship	Non-Scholarship	Entire class	Scholarship	Non-scholarship	Entire class	Scholarship	Non-scholarship	Entire class
Number of cases...	184	184	816	186	186	829	204	204	820
Mean.....	259.9 (±2.0)	260.0 (±2.0)	255.0 (±1.1)	190.6 (±2.0)	190.8 (±2.0)	190.9 (±0.9)	504.6 (±4.7)	503.5 (±4.7)	497.6 (±2.4)
Median.....	254.1 (±2.5)	255.0 (±2.5)	253.8 (±1.2)	191.5 (±2.5)	191.9 (±2.5)	191.6 (±1.0)	503.6 (±5.9)	503.6 (±5.9)	496.8 (±3.0)
σ.....	48.8 (±1.7)	48.7 (±1.7)	48.0 (±0.8)	38.9 (±1.5)	38.7 (±1.5)	38.6 (±0.7)	68.2 (±3.4)	68.0 (±3.3)	67.6 (±1.7)

This justifies the assumption that for these two groups, *equal to each other* in intelligence rating and each truly *representative of the group intelligence of the entire class*, any difference in scholastic achievement found is due to other factors than intellectual potentiality, e.g., to such differences as diligence and application.

VALIDITY OF THE METHOD OF PAIRING

It is, of course, a question how much weight can properly be allowed this special motivation induced by the system of scholarship aid. Other factors also play their part and without further investigation it would be as erroneous to ascribe to this source of specific motivation all of the differences observed between the two groups in scholastic achievement, as it would to ascribe none of them to this factor. Students planning to undertake the burden of working their way through college, as a result of home influences, encouragement by teachers or vocational ambition, might be expected to form

a group exhibiting by nature greater interest for study than does the average group of non-self-supporting undergraduates. Certainly without evidence to the contrary, it might well be supposed that higher than average grades for such a self-supporting group would have characterized their preparatory as well as their college work, and would not necessarily be attributable to purely financial motivation *after* matriculation. In an effort to determine to some extent the importance of the special motivation factor relative to other possible inherent factors, a comparison was made between the two groups, on the basis of their College Entrance Examination Board marks. School records involving hundreds of different private and public schools all over the country obviously offer too heterogeneous a basis for such comparison. The first opportunity for testing all these students by the same scale is accordingly afforded by the entrance examination grades. Such comparison reveals a rather surprisingly close correspondence between the two groups with reference to their average marks received in entrance examinations. The non-scholarship group in the Class of 1925 averages 72.3 ($\pm$0.6) and the scholarship group 71.8 ($\pm$0.4); for the Class of 1926, these averages were 73.3 ($\pm$0.6) and 72.9 ($\pm$0.5) respectively; and for the Class of 1927, 73.2 ($\pm$0.5) and 72.8 ($\pm$0.5) The σ values for 1925 were 7.8 and 8.0; for 1926, 7.0 and 6.9; for 1927, 7.5 and 7.0. On this basis, therefore, no significant difference between the two groups in scholastic achievements prior to matriculation is apparent. We may therefore state that the two groups not only appear equal in *intellectual potentiality* on the basis of their mental ratings, but also that their actual *scholastic attainments* up to the time of entrance into college likewise appear equal. These considerations would seem strong arguments in favor of the potency of the special motivation induced by the method of scholarship awards.

SUB-DIVISION OF PAIRED GROUPS

Experience in dealing with the problems of students working their way indicates that the degree of financial need affects their response to the stimulus afforded by scholarship aid. In the first place, some students registered for employment and applying for scholarships need only to earn a small part of their own expenses. They can really meet their financial obligations without scholarship aid and hence are not as strongly motivated by the scholarship system as are those to whom such assistance is of paramount importance. On the other hand, there are also students so sorely pressed to make both ends meet that their remunerative labor seriously interferes with their studies and the motivation factor in their case is partly obscured by conflicting economic considerations. The groups of scholarship applicants tabulated above therefore may properly be divided into three sub-groups, separated from each other by two critical points—that below which financial need is not sufficiently important to induce specific motivation in quest of scholarship

aid (sub-group I) and that above which the financial need is so acute as to affect scholastic standing adversely in spite of high motivation (sub-group III). The remainder (sub-group II) comprises those students who are sufficiently in need to strive for scholarships but not so overburdened by their self-support activities as to be unable to do themselves justice in the classroom. It is in fact probable that, with respect to self-support as with respect to other interests, a *moderate* degree of extra-curricular activities need not prevent a student's meeting adequately the demands of the present-day college curriculum but may even be accompanied by better classroom work than characterizes the mere social idler. At the same time, *too great* a degree of application to any non-academic interest usually militates against the student's grades, whether expended upon earning money or in the pursuit of editorial, managerial or athletic prominence.

In an effort, therefore, to separate from the whole group of scholarship applicants those whom the specific motivation induced by the system of financial aid might be expected to stimulate most strongly along academic lines, the Bureau of Appointments' records of money earned by the students in question were investigated. The scholarship applicants were then divided, for each year, into the three sub-groups discussed above. Number I comprises those devoting less than five hours per week to self-support; III those devoting thirty hours or more; II the intermediate sub-group. Since not all of the earnings of students are recorded in the Bureau's files these classifications were necessarily based in part upon subjective opinions of those most closely in touch with the needs and efforts of the men in question, i.e., the Student Employment Department staff of the Bureau—who also estimated the amount of time spent for the various sums earned. Such judgments however were made without reference to the scholastic or intelligence ratings of the students and in conjunction with the file records of money earned. In view of the nature and preponderant influence of these objective data and of the size of the groups, it is unlikely that any errors of classification sufficiently serious to invalidate the results have been introduced. Sub-group II of each group of scholarship applicants therefore represents those self-supporting students who fall between the two critical limits of financial need, that is, those who are definitely motivated by financial considerations toward academic effort but who are not forced by circumstances to earn so much money as seriously to handicap their classroom work.

The individual mental test pairs of those students making up the scholarship sub-groups we may similarly divide, designating them, as a matter of convenience, as non-scholarship sub-groups. Since the original grouping is based on the amount of self-support employment undertaken by scholarship students, this basis of differentiation naturally loses its special significance with respect to the students not so employed. The non-scholarship sub-groups are then

merely constituted of the individual pairs of the self-supporting students; and as such are comparable with the latter in regard to respective achievements.

The intelligence distributions for the whole scholarship and non-scholarship groups have already been found (table 1) to be representative of their entire classes. Scholarship sub-groups I + III and II are, in mental rating, of course, equivalent respectively to non-scholarship sub-groups I + III and II with which they are paired. But is it possible in the process of breaking up the whole scholarship and non-scholarship groups in each class into sub-groups, that some significant difference in intellectual potentiality between such sub-groups has inadvertently appeared? The intelligence means of the sub-groups for the first two years are only slightly at variance with the means of the whole group, the maximum difference being 0.07σ of the class distribution for 1925 and 0.05σ for 1926. For 1927, however, the mean of sub-group II, 84 cases, is 0.16σ above, and that for sub-groups I + III, 120 cases, is 0.12σ below, the mean for the whole 204 cases.

The students comprising both scholarship and non-scholarship sub-groups II in 1927, although equal *to each other* in mental ratings, appear slightly superior to their classmates in sub-groups I + III. Whether or not this chance difference is sufficient to impair the comparison between sub-groups in 1927, it does not appear in 1925 or 1926. Therefore records of the sub-groups in those classes, at least, may validly be compared with data for the groups as a whole.

CLASSROOM RECORDS OF SCHOLARSHIP AND NON-SCHOLARSHIP GROUPS

We may now turn to the main problem, a comparison of the classroom records of the scholarship and non-scholarship groups in each class and of the paired sub-groups. The scholarship applicants as a whole clearly excel in classroom averages. In fact, 77, 75 and 74 per cent respectively for the Classes of 1925, 1926 and 1927 of the scholarship applicants, exceed the medians of the contrasted groups of non-scholarship applicants. Table 2 gives the significant differences, in scholastic achievement, between the groups compared.[7] There is noticeably high agreement between the three college classes investigated, which indicates reliability for the observed differences and emphasizes their significance.

A general average for the self-supporting students of better than quality credit grades and of honors grades for their upper quartile, compares so favorably with the averages obtained by the otherwise similar non-self-supporting groups, as to indicate conclusively that greater diligence on the part of the students working their way has more than offset their financial difficulties. In the case of those whose difficulties are not immoderately acute, the differences between them and their non-scholarship pairs become even

[7] A further analysis of such differences and complete distribution tables are contained in the original article.

more striking. The effect of specific motivation induced by the method of awarding tuition scholarships seems clearly evident. Judging by their classroom records, the investment of university funds in these students appears to be justified.

test given the 1925 Freshmen showed, for the whole class, more reliability than those given in the following years, possibly due to experiment, in the latter, with certain new elements. The correlation between ratings and grades was for various

TABLE 2

Scholarship and non-scholarship groups of Yale Freshmen (representative of their respective classes and equal to each other, in mental ratings) compared as to classroom grades in Freshman Year. Sub-group II, consists of scholarship applicants engaged more than 5 but not more than 30 hours per week in self-support work, contrasted with their respective non-scholarship pairs of equal mental rating.

	1925			1926			1927		
	Scholarship group 184	Non-scholarship group 184	Entire class 816	Scholarship group 186	Non-scholarship group 186	Entire class 839	Scholarship group 204	Non-scholarship group 204	Entire class 820
College entrance examination board: Averages									
Mean	71.8	72.3		72.9	73.3		72.8	73.2	
σ	7.8	8.0		7.0	6.9		7.0	7.5	
Freshman year grades:									
Mean	75.5	69.7	71.5	75.0	70.3	72.5	75.7	71.1	72.5
Median	75.7	69.7		75.8	70.4		75.7	71.1	
σ	8.3	8.0	8.0	7.1	7.8	8.1	7.6	7.6	8.0
Mean for highest intelligence quartile	84.6	75.8		82.7	75.8		82.3	79.3	
Per cent of scholarship group equalling or exceeding median of non-scholarship group	77%	24%		76%	25%		74%	27%	
Per cent of scholarship applicants of sub-group II exceeding or equalling the median of their non-scholarship pairs of sub-group II	83%	16%		79%	22%		79%	22%	

CORRELATIONS BETWEEN MENTAL TEST RATINGS AND SCHOLASTIC GRADES

Comparison of the correlations existing between the mental ratings and the Freshman Year grades evidences similar differences between the two groups. The intelligence

reasons higher for the whole Class of 1925, than for the Classes of 1926 or 1927 and the same conditions influenced the correlation coefficients of the contrasted groups within these two latter classes.

A further factor tending to reduce not only the correlation between mental ratings and grades but also the

differences between median scholastic achievements of the contrasted groups, is the increasingly rigid process of selection for entrance. The proportion of students admitted, to final candidates for entrance, was for the Class of 1925, 61.2 per cent; for 1926, 59.6 per cent and for 1927, 55.7 per cent. The proportions admitted without condition were respectively 68.2 per cent for 1925, 74.3 per cent for 1926 and 78.9 per cent for 1927. Numerical limitation of matriculants, in spite of increased numbers of applicants, tends to raise the scholastic standard for the entire class and by more rigorous selection to reduce the possible differences among those admitted. This in turn allows less play to the specific motivation factor investigated. As selection becomes more keen, correlations between or differences within any parts of the more highly selected groups may be expected to decline. It is this factor, rather than any decline in the variability or reliability of the mental tests themselves, which may be chiefly responsible for the fact that the observed differences, although still clearly significant, show a tendency to diminish successively. In each case the scholarship group nevertheless shows a correlation markedly higher than does the non-scholarship group.

TABLE 3

Scholarship and non-scholarship groups of Yale Freshmen, equal to each other in mental rating, compared with reference to the correlation between scores on Anderson Intelligence Tests and Freshman Year grades. The first two columns give the entire scholarship and non-scholarship groups; the next two the coefficients for scholarship sub-groups as described in text.

	WHOLE GROUP		SUB-GROUPS I + III (SCHOLARSHIP APPLICANTS WORKING NOT OVER 5 HOURS A WEEK, CONSTITUTE SUB-GROUP I; THOSE WORKING MORE THAN 30 HOURS A WEEK, SUB-GROUP III)	SUB-GROUP II (SCHOLARSHIP APPLICANTS DEVOTING MORE THAN 5 BUT NOT MORE THAN 30 HOURS PER WEEK TO SELF-SUPPORT)
	Scholarship	Non-scholarship	Scholarship (I + III)	Scholarship (II)
1925:				
Number of cases	184	184	99	85
r	.66(±0.02)	.46(±0.03)	.51(±0.05)	.70(±0.03)
1926:				
Number of cases	186	186	111	75
r	.55(±0.02)	.39(±0.03)	.40(±0.06)	.67(±0.04)
1927:				
Number of cases	204	204	120	84
r	.44(±0.04)	.33(±0.04)	.35(±0.06)	.57(±0.05)
Mean of r's for 3 years	.55	.40	.42	.65

In table 3 the coefficients of correlation between scores on the Anderson Test and Freshman Year grades are given in the first two columns

for the whole scholarship and non-scholarship groups respectively. In the third column are similar values of r for those students comprising scholarship sub-groups I and III. It will be recalled from the previous explanation that sub-group I consists of scholarship applicants classified as working not more than five hours per week on self-support; and sub-group III those working more than 30 hours. The fourth column in the table gives the values for presumably the most effectively motivated scholarship applicants—sub-group II, devoting more than 5 but not more than 30 hours per week to self-support activities.

Not only is the correlation higher for the scholarship groups as a whole in each of the three years, but that for sub-group II has in each case the highest value of all. All coefficients are positive and were calculated by the product moment method. Probable error values given in brackets are obtained by the usual formula.

Although not all of these correlations are particularly high, a definite positive relation between such intellectual potentialities as are measured by the test and scholastic achievement is clearly evident and this relation increases with motivation. The observed differences compare favorably with those found by other investigators previously cited and appear to be of sufficient significance to warrant further investigation.

The factors tending to reduce the correlations seem to have different origins in the two groups. Relatively few scholarship applicants with high test scores fail in their college grades to measure up to their mental rating possibilities; but a considerable number somewhat below the intelligence mean secure higher grades than might be expected. With the non-scholarship students just the reverse is true, relatively few exceeding their apparent possibilities and many with high mental ratings doing mediocre or poor work in the classroom. In the Class of 1925 not a single scholarship applicant more than 0.5σ above the median in mental rating averaged less than 70, the minimum grade necessary for scholarship aid; while for 1926 there were but two instances and for 1927, five. As compared with this total of only eight such cases among the 574 scholarship students in these three classes, forty-four occurred among their non-scholarship pairs.

As already stated more discrepancies among the scholarship students appear in the case of men rating below the mean in intelligence but still doing creditable classroom work. Yet even here the disparity is not great. A total of only twenty-six scholarship applicants in the three classes, who were more than 1.0σ below the intelligence mean, made an average scholastic grade of 70 or better, and only one man in the three years, 2.0σ or more below the intelligence mean, was able to maintain that average grade. The chances are indeed so clearly against such students being able to maintain even the minimum scholastic average necessary to continuance of financial assistance, as certainly to justify refusal of scholarship aid at matriculation to any student in the lowest decile in mental rating, and probably to any in the lowest quartile.

The evidence submitted would

therefore seem to substantiate definitely the belief that the predictability of grade standing from mental ratings becomes more reliable as motivation is increased. The considerable amount of increase of this relationship in the cases studied, as a result of motivation financially induced, is certainly an argument in favor of the value of such tests so far as determining a student's potential standing is concerned.

CONCLUSIONS

The following conclusions seem warranted by the various observed differences:

Greater diligence on the part of self-supporting students, as indicated by scholastic achievement, may more than offset their financial handicaps particularly if the latter are not excessively great.

Financial aid to such students is apparently reflected in its effect upon their grades.

The system of having scholarship stipends determined by scholastic grades provides a definite motivation factor which clearly tends to raise the grades of such students above the average.

This system also provides an opportunity for studying specific motivation effects.

Such specific motivation tends definitely to increase the predictability of grade standing from mental ratings.

SUMMARY

All applicants, in three successive entering classes, for Freshman Scholarship awards upon matriculation were paired, on the basis of their mental test ratings, with classmates not expecting to earn any of their own expenses. Thus two groups were obtained for each class, equal to each other in mental ratings and each a representative sample of the intelligence distribution of the class as a whole. Comparison of the entrance examination averages of these two groups showed no differentiation on the basis of scholastic attainments prior to matriculation. Therefore the inference seems valid that these groups in each class are undifferentiated in other significant respects than that of academic motivation, induced in part at least by the system of scholarship awards at Yale.

Comparison of the Freshman Year grades of these students shows that 75 per cent of the scholarship applicants as a whole equal or exceed the median grade of the less highly motivated but otherwise comparable non-scholarship group. This difference between the medians, corresponding to about 0.7 of the σ of the grade distribution, was very nearly the same for the three classes studied, 1925, 1926 and 1927.

Comparison of the correlations between mental rating and Freshman grades showed a higher coefficient for the scholarship than for the non-scholarship group in each class, the mean of the r values for the three years being $+.55$ and $+.40$ respectively.

Further study of the motivation effect of scholarship aid upon both the grade average and the correlations between mental ratings and grades, was undertaken by subdividing the scholarship group on the basis of the

Bureau of Appointments' records of the individual students' earnings. Scholarship sub-group I comprised students devoting not over five hours per week to self-support and sub-group III those working more than thirty hours per week to earn expenses. Sub-group II is considered to represent those scholarship students sufficiently in need to be highly motivated by the system of financial aid but not so hard pressed as to have their self-support activities interfere excessively with their studies. This sub-group therefore is the section presumably most highly influenced by the motivation factor; and if the previously mentioned differences are properly attributable to greater motivation of the scholarship applicants as a whole, then those differences should become even more pronounced upon comparing sub-group II of the scholarship applicants in each class with their respective non-scholarship pairs.

The comparison so made substantiates the previous findings. Eighty per cent of the scholarship students in sub-group II equal or exceed the median of their non-scholarship pairs. Also the correlation between mental ratings and grades is in each class highest for scholarship sub-group II. The mean of the r value for the three years is, for the non-scholarship group +.40, for scholarship sub-groups I + III, +.42; while for scholarship sub-group II (the most influenced group) it rises to +.65.

The inferences are (1) the higher degree of motivation of self-supporting students, particularly if encouraged by grading financial aid in accordance with classroom records, will on the whole more than offset the difficulties of students working their way; (2) objective data confirm the theoretical assumption that the predictability of academic achievement from mental test scores becomes considerably more reliable with increased scholastic motivation. Reliability of the observed differences and of the conclusions drawn from them is evidenced by the close correspondence of findings for the three college classes, and by agreement between the first part of the investigation, dealing with differences in scholastic averages, and the second part, dealing with correlations between such averages and mental ratings. These general findings are further substantiated by the data on special sub-groups in each class.

(Manuscript received June 29, 1925.)

Book Reviews

LINKING SCIENCE AND INDUSTRY

Edited by Henry C. Metcalf. Baltimore: The Williams & Wilkins Company, 1925. Pp. 206

REVIEWED BY ARTHUR W. KORNHAUSER

During the winter of 1923–1924 the Bureau of Personnel Administration in New York conducted an evening course for executives, the purpose of which was to discuss "the contributions of the humanistic sciences to the art of business management." The course consisted of a series of lectures by prominent business men and educators. The sixteen lectures, with an introductory statement by Dr. Metcalf, under whose direction the course was given, constitute the present volume.

The contents of the book furnish an interesting illustration of the advantages and the shortcomings of instruction courses of this type, that is, a series of discussions by different speakers. On the positive side, there is much to be said for the stimulating value of diverse points of view and challenging differences of opinion. Such diversity and challenges are not wanting in the present collection of papers. The chief difficulty with the method is that the parts leave no unified impression, few of them can be knit together even with considerable effort. The net effect is similar to that secured by reading through the varied articles in a magazine—one that contains a few mediocre papers, a number of worth while contributions, and several extremely valuable ones. These last alone may well justify the method of instruction and likewise the publication of the material.

The sixteen lectures are:

I. *New Tendencies and Problems in Business Management.* By H. S. Person (Director of the Taylor Society). An attempt is made in this paper to state the few major problems of present day business administration and management, such as the anticipation of industrial tendencies and the stabilization of the business unit; determination of a definite policy of relations to government; establishment of a sound policy of industrial relations; better technical management; and better coordination of functional departments. Some interesting suggestions are advanced in regard to each of these needs.

II. *Executive Initiative and the Formulation of Sound Personnel Policies.* By E. K. Hall (Vice-President of the American Telephone and Telegraph Co.). The primary objective of personnel work is held to be the development of morale, the improvement of the *status* of the worker or his feeling of "worth-whileness." The responsibility for developing an effective personnel program is placed squarely upon management. But there is no formula for what is sound in personnel matters. "Coöperation rather than any clear-cut program is needed." "The personnel man must work through the regular executives. . . . . In most cases where personnel work has gone to smash, it was because the personnel man, in his enthusiasm, tried to do everything himself."

III. *Nature's Administrative Methods.* By William Patten (Professor of Zoology, Dartmouth College). The subject matter of this address is rather far removed from the main contents of the book. It is a description of the Dartmouth College freshman course in evolution. The central thesis is that evolutionary processes are

moral and good, and that the study of evolution "makes life more significant and beautiful. It fortifies our faith and justifies our ideals; it makes God a more imminent reality."

IV. *The New Task of Personnel Management.* By Alvin Johnson (Editor of the New Republic). A brief historical sketch of labor's changing status is made the basis for the view that the control of workers through the fear motive is fast becoming inadequate. "For the fears that formerly broke the spirit of the workers are disappearing." Some bits of not altogether convincing evidence are cited to justify this belief. The task of personnel management is to find a substitute for control through fear—some "system of motives that correspond with the condition of a permanent native population."

V. *Man and Men.* By Cassius J. Keyser (Professor of Mathematics, Columbia University). This paper deals definitely with the topic "Linking Science and Industry." It is broad and general in its outlines but contains many telling statements and illustrations. The author contends that "science is self-justified; industry is not. . . . . The problem of linking science with industry is the problem of making industry serve mankind." There follows an extremely able appeal for a social point of view in our human relations and for a fuller appreciation of the past and future of *humanity.*

VI. *Personnel: The Outstanding Problem of Public Administration.* By William E. Mosher (Syracuse University, School of Citizenship and Public Affairs). A clear matter of fact description is given of the main personnel accomplishments of civil service organizations, together with a statement of the chief difficulties and problems confronted in this field. Certain pioneer work has been done in the public service in practically every phase of personnel management, it is maintained, but progress is slow and restricted because public executives have not yet come to appreciate the place of personnel as a major executive function.

VII. *The Measurement and Control of Human Behavior.* By Robert M. Yerkes (Yale Institute of Psychology). This address deals with the topic of individual differences and their measurement—differences in emotional and temperamental qualities as well as intellectual. The "nature versus nurture" problem is discussed in relation to tests, with the author betting pretty heavily and perhaps a little too confidently on the nature side. The value of psychological tests in personnel management is pointed out and the need for separate measurements of a wide variety of traits (the "profile" method) is emphasized.

VIII. *Health and Efficiency in Industry.* By C.-E. A. Winslow (Professor of Public Health, Yale Medical School). Two or three terse paragraphs are given on safety, illumination, ventilation and dust, industrial poisons, medical examination, adapting the man to the job. The case for the industrial physician is briefly and convincingly presented.

IX. *Industrial Psychiatry.* By C. Floyd Haviland (Chairman, New York State Hospital Commission). "No person can live a normal, socially useful life without securing direct or indirect gratification of fundamental desires by socially acceptable methods." A more or less traditional list of instinctive desires is given and the need of satisfying each is pointed out. The theoretical structure that is used is less satisfactory than the very interesting discussion of emotional disturbances in some of their industrial bearings.

X. *Intelligence versus Reason in Personnel Administration.* By James Harvey Robinson (Writer, lecturer and historian; author of "Mind in the Making"). The view is set forth in very general terms that many basic human affairs are not logical and cannot be understood or dealt with as long as we try to treat them logically. "Accordingly in all our efforts to better human relations we should devote no small part of our attention to the still undeveloped art of disintegrating prejudices—which are the chief obstacle in the way of reconsideration and readjustment."

XI. *The Problem of Controlling Wages.* By Walton H. Hamilton (Professor of Economics, Washington University). This

paper presents, in a few pages, a comprehensive and critical outline of the major questions concerning wages. A few of the headings are: explanations of wages, wages and other incomes, wages and production, the power of economic groups, the prices of goods, a theory of wages, towards a wages policy. The material emphasizes the complexity of the influences determining wages and the inadequacy of any single simple theory. It also serves excellently to orient one and give him perspective in his thinking about special theories of wages and detailed problems in this field.

XII. *The Evolution of the Labor-Capitalist Class.* By Thomas Nixon Carver (Professor of Political Economy, Harvard University). The writer contends that "the processes are now at work under capitalism . . . . which will put such great power in the hands of our manual and clerical workers, that it will enable every occupation to prosper." This general increase in prosperity is due essentially to the fact that in this country (as contrasted with England) we are supplying sufficient entrepreneur talent to make possible the effective utilization of our capital and our labor. Restrictions of immigration and increases in capital accumulation will hasten the increase in the demand for labor and the rewards given to labor. Increasing investment of capital by labor is "one of the most striking phases of this revolution." Labor and capital are fusing, for "there can be no class consciousness after the laborers are all capitalists. When their capital becomes sufficiently abundant so that there is real difficulty in finding investments, interest rates must come down. A good many people living on the returns from capital will then have to work, supplementing their income by working for wages or salaries. . . . . We shall have wiped out the distinction between capitalist and laborer."

XIII. *Coöperative Arrangements between Management and Workers on a Railroad.* By George Soule (Member of the Labor Bureau, New York). The much discussed Baltimore and Ohio Railroad shop plan is described here with special emphasis on the historic development of the experiment and on its underlying philosophy. A number of details of the actual plan and its operation are presented in addition. The whole constitutes an exceedingly valuable account of one of the most significant experiments in the field of labor relations.

XIV. *The Relation of European Conditions to American Business Management.* By Harold G. Moulton (Director of the Institute of Economics, Washington, D. C.). After pointing out and illustrating the fact that business conditions are markedly affected by foreign conditions, the author proceeds to give a penetrating analysis of Germany's economic life and its probable influence on international trade. There is very little in the way of specific application to "American business management."

XV. *Revolutionary Radicalism in American Labor.* By Benjamin Stolberg (Writer on labor subjects). There are only two organized revolutionary groups in American labor—the Independent Workers of the World and the Workers' Party of America. The first is dismissed with only a few words as it has "no significance today." The other group—the Communist organization—is treated in some detail, both its history in this country and its relation to the international Communist movement. Particular attention is given to William Z. Foster and his Trade Union Educational League. The author's evaluation is that "the Communists (including Foster) are hampering the natural progressive forces" in the American labor movement.

XVI. *Periodic Planes of Creation.* By Robert B. Wolf (President of the R. B. Wolf Co.). "The main thesis of this paper is that while different sets of laws obtain in the Mineral, Vegetable, Animal, and Human kingdoms, nevertheless throughout all four kingdoms evolution progresses through similar recurring periodic steps analagous to those in the periodic table of the chemical elements." The "periodic steps" in each kingdom are described and interrelated and the whole is made to lead up to the conclusion that "the competitive separateness, which is

proper for the Animal, becomes a barrier to progress in the coöperative Human kingdom, where greed must be supplanted by unselfishness, and acquisitiveness by the motive of service." The paper contains much that is figurative, over-simplified, and even fantastic.

Consideration of the book as a whole leaves one with the feeling that there is little real science in these lectures on "Linking Science and Industry." Nor is this a criticism of the present writers. The sad truth is that we are still far from having basic scientific principles as a foundation for personnel administration. The title of the papers might appropriately have been "Industry's Need for Social Science." That need is attested on every page.

Two thoughts of minor importance may be added. First, the suggestion that a brief "Who's Who" of the contributors would be valuable since many readers will not be acquainted with all the lecturers. (The parenthetic identifications used in this review are taken from an advertising announcement of the book, with two or three slight changes.) Second, a word in appreciation of the careful workmanship of the volumes in this "Human Relations Series" and of the spirit represented in the "sans tache" note and in the publishing of the names of all the craftsmen who contributed to the making of each book.

ESSENTIALS OF PSYCHIATRY

By George W. Henry.

Baltimore: The Williams & Wilkins Company, 1925.

Pp. xiv + 199

REVIEWED BY C. S. YOAKUM

This book, written by a specialist in the field of psychiatry, is intended for the general medical practitioner and the medical student. Nevertheless, it does not assume a knowledge of medicine nor does it describe conditions of mental disease in the technical terms peculiar to psychiatry. Though written more especially for the medical profession, as just stated, it probably constitutes the best recent manual for the personnel manager and his staff, who are concerned with the mental as well as physical well-being of the personnel of their plant. For those who are unfamiliar with the field, it might profitably be preceded by such a book as Bernard Hart's "Psychology of Insanity."

The author presents a tentative classification that is simple and worth familiarizing one's self with. He follows it carefully throughout, thus making the major facts readily obtainable. There is some tendency to confusion in the repetition of similar trait terms under different clinical pictures. This may be taken as evidence of the present inability to depict clearly personalities even of the exaggerated types. Trait terms are yet too fluid and inexact in their meanings to picture accurately even abnormal behavior. To the personnel worker this is a frank warning that they may often be in error regarding the more normal personalities with which they more frequently deal.

The first two chapters deal with personality, albeit without showing any noticeable influence of recent views respecting instincts, emotions and habits. On the whole they give a working picture of important stages and conditions of human mental development. Chapters 14 and 15 should be read in close connection with the first three chapters. Chapter 11 of Watson's "Psychology as the Behaviorist Sees It" gives a more systematic treatment of the personality. Including Hart, mentioned above, these three references should give the personnel man or general business executive a starting point for judging the general adequacy of his equipment in the

concern for handling the deviations in personality. Certainly they should cause him to recognize the importance of the problem and to supply through the medical department proper emergency methods.

Chapters 4 to 10 describe clinically the different psychoses. These are of less importance to our readers than those mentioned and others on nursing and the medico-legal phases of the subject. But seldom will the personnel man be called upon to deal with extreme forms of mental disease. He should, however, be sufficiently familiar with the field to maintain a sympathetic and understanding attitude toward the psychiatric social worker, the modern habit clinics, and the work of the psychiatrist in his community. An understanding of the point of view and attitude expressed in "Essentials of Psychiatry" will aid him materially in judging the efficiency of his plant's medical department.

Greater emphasis on the early stages of mental disease is increasingly noticeable in the writings of psychiatrists. The paragraphs on early symptoms are disappointingly short. Good physical conditions are properly emphasized. In the great majority of cases physical examination is the easiest approach to the confidence of patients threatened with mental difficulties. The early pages of the chapter on psychiatric nursing (chapter 12) should be familiar to all industrial nurses.

THE PSYCHOLOGY OF SELECTING MEN

By Donald A. Laird. New York: McGraw Hill Book Company, 1925. Pp. xi + 274

REVIEWED BY HAROLD E. BURTT

The book is designed both for use in psychology class rooms and for introducing psychology to the business man. It aims to "set forth a technical account in a non-technical way of the fundamental considerations in selecting men." In the reviewer's opinion it does this well.

This volume is very readable. Its style is crisp. Facts are presented clearly, many of them graphically. There are 149 charts. There are also various novel and commendable features, such as presenting photographs and requiring the reader to estimate intelligence therefrom (with a key at the end of the chapter), or presenting samples of handwriting and requiring the reader to state the sex of the writer. These various devices get the reader's attention and interest. The author is to be complimented on his courage in reproducing advertisements of certain pseudo-psychologists (Blackford, Bush, Merton) with appropriate comments.

To the applied psychologist this book will prove worth reading because it will give him new ideas as to presenting his material to students or business men. On the whole it ranks well toward the top of the group of works which are appearing in this general field.

At the outset a note of caution is sounded in the selection of a psychologist to undertake employment research. Typical instances from the psychological underworld are cited and on the other hand reputable agencies, such as the Psychological Corporation, are mentioned.

Chapter 2 discusses the field and function of employment psychology bringing out the possibilities of (1) selecting candidates; (2) eliminating inefficient employees; (3) placing according to abilities; (4) selecting apprentices; (5) settling labor disputes and internal plant troubles; (6) detecting temperamental and personality handicaps. The need for such procedures is shown by a consideration of typical labor turn-over data, especially the per cent of discharges (averaging 39 per cent) due to unadaptability.

The next two chapters deal with individual differences. The normal distribution curve is presented with data on industrial production showing how the shape is changed by increasing the number of cases

or by eliminating extraneous factors. The fallacy of attempting to classify persons into types is shown, and the fact that we are dealing with traits that are present in varying degrees is brought out. To explain the origin of individual differences data are presented showing the importance of heredity.

Before proceeding to specific employment methods three necessary principles are laid down. The measures used must be reliable in the sense of agreement between successive measurements. They must be objective so that different persons will make the same interpretation. They must be valid in the sense of predicting adequately the thing which it is desired to predict.

Chapter 5 discusses the letter of application. On two occasions responses to a want advertisement were rated as to various traits of the writers. Reliability was very low inasmuch as the successive ratings showed little agreement. Similarly the validity of the estimates was very poor when compared with estimates made by intimate acquaintances. Moreover the estimates of the different traits correlated rather high with one another indicating the effect of the "halo" of general impression. Other experiments show the impossibility of judging character from hand writing.

Chapter 6 deals with the employment interview. When different executives interview a group of candidates independently, marked disagreement has resulted. In instances where the results of the interview were compared with later production it developed that some interviewers were fairly accurate while others were very poor indeed. To avoid the error of general impression some form of rating blank is suggested which calls attention to specific traits.

Chapter 7 takes up character reading. Phrenology is refuted by a map of the brain as presented by the phrenologist and a similar diagram of cerebral functions as far as they are known to the psychologist. As to the claims of physiognomy, experiments are cited in which it developed that blonds possessed alleged brunette traits to as great an extent as brunettes themselves, and vice versa. Other experiments in which quantitative measurements of physiognomic characteristic were correlated with estimates of intimate acquaintances showed that there was absolutely no connection, as alleged, between the two factors.

Chapter 8 deals with the applicant's industrial history. Estimates of one's own ability are dubious, as shown by experiments in which self estimates were compared with estimates of acquaintances—the tendency being to over estimate oneself in good traits. With reference to the ability of others to judge an applicant's traits, it is shown that a single judge is not very reliable, so it is better to take the average of the estimates of several judges. Certain traits seem to furnish more reliable judgments, for instance, the traits that yield some objective product, such as work accomplished, salary, property owned, etc.

Chapter 9 takes up measuring the success of employees. It is necessary at the outset to know which employees are successful in order to evaluate whatever selective methods are devised. It is best to get these measurements in physical units and to record them mechanically.

In chapter 10 the following methods of measuring personality traits are discussed: The check list of traits; the man to man rating scale, which was developed in the army; and the graphic rating scale. Various principles are laid down for increasing the accuracy of ratings.

Chapter 11 goes into statistical methods. It includes a detailed description of two conventional procedures for computing correlation coefficients. The probable error is likewise discussed. The meaning of correlation is interpreted by the formula $1 - \sqrt{1 - r^2}$. This tells by what per cent the prediction is better than chance.

A different statistical technique is presented in chapter 12 on group comparisons. Successful and unsuccessful workers may be tabulated with reference to some other variable such as marital condition. It is necessary however to check other factors, such as age, to determine which is the crucial factor in differentiating the successes from the failures. The statistical method of determining when a difference

is significant is discussed. To illustrate the application of the group method a study is described of the items in a personal history blank for insurance salesmen which, when properly evaluated, gave some indication of selling ability.

Chapter 13 deals with the use of psychological tests in selection. The greatest expense in a testing program occurs at the outset when the validity of the tests is being determined. Subsequently if the tests are valid they should effect a distinct economy. Five different methods of testing are presented; trials at the work, miniature occupations, essential conditions of the work, the empirical method, and trade tests.

The last chapter deals with the construction and evaluation of tests. It distinguishes individual, group, verbal, and performance tests with brief illustrations of each. It also distinguishes tests of ability in a trade or in educational subjects from tests of capacity. Characteristics of a good test are mentioned. The reliability of the test may be determined by repeating it or by correlating one part with another, and the validity may be determined by correlating it with ultimate occupational success.

The most adverse criticism the reviewer has to make of the book is in connection with the references. Certain suggested readings, which are doubtless adequate for the layman, follow each chapter. However, there are frequent mentions in the text of specific experimental studies which it would be difficult to run down because only the experimenter's name is given. A more extensive treatment of specific mental tests applied to a practical situation would be helpful. While the other matters have not received undue emphasis, mental test procedure has a greater contribution to make to employment problems than the extent of its treatment would imply. Interpreting correlation coefficients to the layman is always a difficult proposition. Whether Laird's scheme of stating "the per cent better than chance" will be more lucid than other treatments remains to be seen.

Books Received

(Notice here does not preclude fuller notice later)

1. *What the Coal Commission Found.* An authoritative summary by staff members. Edited by Edward Eyre Hunt. Human Relations Series: III. Baltimore: Williams & Wilkins Company, 1925. Pp. 416.
2. *Welfare Work in Industry.* By members of the Institute of Industrial Welfare Workers, edited by Eleanor F. Kelly. London: Sir Isaac Pitman and Sons, Ltd., 1925. Pp. viii + 119.
3. *Labor Economics.* SOLOMON BLUM. New York: Henry Holt and Co., 1925. Pp. ix + 579.
4. *Elementary Psychology.* ARTHUR I. GATES. New York: The Macmillan Co., 1925. Pp. xiv + 594.
5. *Labor Relations in Industry.* DWIGHT L. HOOPINGARNER. Chicago: A. W. Shaw Co., 1925. Pp. xvi + 553.
6. *A Theoretical Basis of Human Behavior.* ALBERT P. WEISS. Columbus: R. G. Adams & Co., 1925. Pp. xv + 428.
7. *Salary Administration.* Report by the Committee on Salary Standardization of the Office Executives Division, American Management Association, New York, 1925. Pp. 127.
8. *The Employment of Young Persons in the United States.* New York: National Industrial Conference Board, 1925. Pp. viii + 149.
9. *Can Business Prevent Unemployment?* SAM A. LEWISOHN, ERNST G. DRAPER, JOHN R. COMMONS, DAN D. LESCOHIER. New York: Alfred A. Knopf, 1925. Pp. 227.
10. *Personnel Management on the Railroads.* Policyholders' Service Bureau, Metropolitan Life Insurance Company, New York. Simmons-Boardman Co., 1925. Pp. xv + 227.

11. *Profits.* WILLIAM TRUFANT FOSTER and WADDILL CATCHINGS. Pollak Foundation for Economic Research. Boston: Houghton, Mifflin Co., 1925. Pp. xxii + 465. $4.00.
12. *Principles of Personal Selling.* HARRY R. TOSDAL. Chicago: A. W. Shaw Co., 1925. Pp. xii + 752. $4.00.
13. *The Construction Ability of Young Children.* LOVISA C. WAGONER. (University of Iowa Studies in Child Welfare Series.) Published by the University, Iowa City, Iowa, June 1, 1925. Pp. 55.
14. *Survey of Hygienic Conditions in the Printing Trades.* S. KJAER. U. S. Bureau of Labor Statistics. Bulletin No. 392. Washington: Government Printing Office, 1925. Pp. vi + 292.
15. *Vacation Policies in Manufacturing Industries.* New York State Department of Labor, Bureau of Women in Industry. Special Bulletin No. 138. July, 1925. Pp. 23.
16. *Personnel Terminology: Definition of Terms Relating to Personnel Management.* Report of Committee on Management Terminology, J. D. Hackett, Chairman. American Management Association, Special paper: No. 10, 1925. Pp. 32.

An invaluable work of reference.

Abstracts

Correlations of Achievement Within an Individual. H. L. HOLLINGWORTH. Journal of Experimental Psychology, June, 1925. Vol. 8, No. 3, pp. 190–209.

The performance of a single individual in a given task varies from moment to moment and from day to day. This is true even in the case of the expert. Such variability from one's own average is characteristic of every type of art or process. Is there any relation between the fluctuations in different processes, within an individual? Are the deviations determined by episodic conditions, or by systematic factors, or by general conditions of the organism?

In an array of performances by six individuals, after preliminary practice has practically eliminated gain from repetition, notable variations in score are nevertheless found, which are symmetrically distributed about their central tendency.

Using such records, stability indices, coefficients of variability, and intra-individual correlations have been computed for six well-known processes.

Intra-individual correlations, between different types of process, approach zero (except as the slight practice gain still present shifts the mode slightly above the zero point). Normal deviations in different types of work thus seem to depend on local and episodic rather than on systemic determinants, although the actual correlations (within an individual) are not much smaller than those ordinarily found between such performances in a group of individuals.

Stability indices are higher than the intra-individual correlations for different processes, but lower than reliability coefficients secured from a group of individuals. Stability indices are inversely related to susceptibility to alcohol.

Coefficients of variability are closely related to stability indices, and vary inversely with drug resistance (alcohol).

Superior average performance, high stability indices, low variability coefficients, capacity for gain through repetition, and high drug resistance, are positively associated, as are their various corresponding degrees.

A Study of the Maladjusted College Student. ZOE EMILY LEATHERMAN AND EDGAR A. DOLL. The Ohio State University Studies, 1925, Vol. 2, No. 2, pp. 56.

A review of the literature of the mental testing movement shows that much experimentation with various tests has been done by college and university authorities. Outstanding results of this movement to 1923 with reference to college studies have been:

1. Correlation of physical with mental measures.
2. Production of a variety of tests for measuring various mental abilities.
3. Determination of college intelligence medians with which the mental level of colleges, classes and individuals can be compared.
4. Use of the ogive or percentile graph to express results of tests.
5. Discovery that other factors than low intelligence are capable of causing academic failure.
6. Discovery of the low correlation between intelligence test scores and instructors' marks.
7. Use of mental tests by college admission boards.

What has all this testing done to benefit the student and to help him to overcome his disabilities? Very little. Only in a few instances have there been attempts to use the results of testing in personal conferences with the students, in discussion of his own problem and in an effort to guide him to a solution of it in accordance with sound psychological principles.

The maladjusted student has been

recognized since 1890. The author offers a three-fold classification of the outstanding problems confronting students. These are grouped under three general heads; scholastic, social and personal.

The Psychological Clinic at Ohio State University has attempted to aid maladjusted students and to investigate the causes underlying maladjustments. To do this they have studied records available at the University and have also made individual case studies. The causes have been classified as mental, physical, environmental, and emotional. Fourteen typical problem cases are described in detail.

Procedure used in the clinical work is as follows:

1. Problem presented. Cause, source.
2. Life history.
3. Patients account of the present problem.
4. Objective tests:
   (a) Verbal tests,
   (b) Non-verbal tests,
   (c) Anthroprometric measures,
   (d) Psychiatric tests and "complex detectors,"
   (e) Analytic procedure (not necessarily Freudian).

Comparison of methods and results with those at other universities shows a real need for the methods of clinical psychology with maladjusted college students. Furthermore, actual clinical study of problem cases in the University psychological laboratory has shown that students can be helped by the application of psychological and psychiatric methods.

Analyzing Personality, Part II: Personality and Vocational Achievement. GEORGE C. BRANDENBURG. Journal of Applied Psychology, September, 1925, Vol. 9, No. 3, pp. 281–292.

Continues the study of two groups of senior engineering students that were ranked in various personality traits. Five and a half years after the graduation of group I letters of inquiry were sent out to members of both groups requesting detailed information concerning their activities along the following lines: (1) Nature of work, (2) writings, inventions and special honors, (3) earned income, (4) miscellaneous activities.

The total personality rating showed some relation to salary. The average salary for the highest third in personality was $3,000, for the middle third $2,316, and for the lowest third $2,076, in one group. Similar figures held with the other group. With intelligence, however, there was no significant relation between score in the army test and subsequent salary nor between school grades and salary. Correlation coefficients revealed the same tendency. Individual traits that showed the highest correlation with salary were accuracy, originality, address, and social and civic interest, while the lowest correlations were obtained for neatness, sincerity, and moral habits.

A good personality is characterized by such traits as enthusiasm, accuracy in work, aggressiveness, and self-reliance; while neatness in appearance, appreciation of humor, and moral traits contribute but slightly. College grades are somewhat less indicative of a student's ability to earn money than is his personality.

Study of Sales Force Compensation and Expense of Ohio Wholesale Grocers, Year 1924. By the Bureau of Business Research, Ohio State University, Columbus, Ohio, August 10, 1925.

Presents data from 53 wholesale grocery houses in Ohio concerning the compensation and traveling expenses of their salesmen, and the relation of these items to the amount of business obtained.

Divides the study into three divisions; (1) volume of sales and selling costs for salesman, (2) methods of compensating salesmen, (3) comparison of results under different methods. Division 1, after discussing the various tables of results concludes that a well-paid salesman who produces a large volume of business tends to be a cheaper investment than a low salaried man who sells a smaller volume of goods.

Plans of compensation varied widely, but four main bases are: (1) Straight salary, (2) salary and commission, (3) commission with drawing account, (4) straight commission. Nearly half of the concerns used

the straight salary method, but those using the commission plan employed, roughly, three-fourths of the salesmen. Each concern has its own method as to rates of commission.

In the third division a comparison is made between eighteen concerns which operate entirely on the straight-salary-expenses-paid plan, and ten concerns which pay commission only and make no allowance for traveling expenses. This comparison is given in the following table.

Results under different methods of compensation

	SALES PER SALESMAN	EXPENSE PER SALESMAN	EXPENSE PER $100 OF SALES
Straight salary, expenses allowed (18 concerns, 99 salesmen)			
High	$174,889.60	$4,365.52	$4.11
Average	131,216.43	3,160.07	2.27
Low	42,435.04	2,071.66	1.43
Straight commission, no expenses allowed (10 concerns, 128 salesmen)			
High	$198,362.25	$5,150.04	$3.32
Average	116,083.07	3,323.99	2.37
Low	55,169.50	2,269.38	1.50

The average cost per $100 of sales for the whole group was $2.58. Concludes that there probably is some significance in the fact that concerns paying a straight salary plus traveling expenses obtained a larger than average volume of sales per salesman at a smaller than average cost per $100 of sales.

Suggested Tests for Road Inspector. OLIVER C. SHORT. Public Personnel Studies, September, 1925, Vol. 3, No. 9, pp. 252–266.

Calls attention to the rapid, tremendous growth in transportation on the highways and points out the need for adequate and careful inspection of highways both during and after construction. Duties of a road inspector are many and varied, and on account of the importance of the position and breadth of training necessary the qualifications are quite rigid. Gives some difficulties encountered in securing desirable men and outlines the various types of applicants.

The following tests are given in full and discussed in detail:

NATURE OF TESTS	SUGGESTED TIME	SUGGESTED WEIGHT
	minutes	
Test 1—Road building operations, materials, and equipment (Section A consists of 30 questions in the so-called completion form with blanks which the competitor fills. Section B consists of 20 questions in the so-called multiple choice form with four answers from which the competitor chooses one. In Section A there are two alternative sets of six questions each and in Section B two alternative sets of four questions each, the ones to be used depending upon whether the road inspector deals mostly with concrete or with asphalt material and equipment.)	75	4
Test 2—Road building procedure. (Section A consists of five road building procedures with a list of operations necessary in performing each; the competitor is to indicate the order of the operations. Section B consists of five road building problems followed by a list of operations, equipment, duties, or materials; the competitor is to indicate by a cross the appropriate items.)		
Test 3—Interpretation of specifications. (Quotations from specifications are given and the competitor is asked 10 questions as to their interpretation.)		

NATURE OF TESTS	SUGGESTED TIME	SUGGESTED WEIGHT
	minutes	
Test 4—Reading blue prints.. (The competitor is furnished with a blue print showing the plan or profile of a road and asked 10 questions as to its meaning.)	75	4
Test 5—Accuracy of observation..... (Ten questions based on a photograph of a road building scene are to be answered from memory.)	10	½
Test 6—Abstract intelligence. (It is suggested that one of the five alternative forms of the army alpha intelligence tests be used and that a minimum score of 75 on the army alpha scale be required.)	50	1
Test 7—Education and experience.....	10	2
Test 8—Personal traits as determined by an interview.	15	2½

The Present Status of Character Measurement. PERCIVAL M. SYMONDS. Journal of Educational Psychology, November, 1924, Vol. 15, No. 8, pp. 484–498.

From a survey of literature, eight different methods of character measurement emerge.

1. *Habit Scales:* The Upton-Chassel Scale for Measuring the Importance of Good Citizenship, with added modifications, is reliable and accurate within the limitations of subjective ratings.

2. *Character or Personality Scales:* Mendenhall's self-rating scales for high school and grade children are examples. Porteus has a "Social Rating Scale" with a three-part gradation, using Scott's recommendations. Features which seem to increase the value of rating scales are: (*a*) Man to man comparison; (*b*) indication of judgment graphically by cross along unbroken line; (*c*) descriptive phrases for various degrees of traits; (*d*) normality of distribution by assigning the number who shall be rated each degree; (*e*) indication of certainty of judgment.

3. *Self-Assurance or Over-Statement Tests:* Voelker, Filter, and Cady each have proposed tests to answer the question: "Can the subject be trusted to make true statements in regard to his knowledge?" The test asks the boy to state his ability or knowledge about certain things and later tests his ability or knowledge.

4. *Squares and Circles Test:* "It attempts to answer the question 'Can the subject be trusted not to peep when he is placed on his honor to keep his eyes closed?'" The correlation with the criterion of incorrigibility is +0.396.

5. *Paraffin Completion:* "'Can the subject be trusted not to cheat in an examination?' is the question proposed." The subject takes a Trabue Completion Test and then scores his own paper. Cheating in the process of scoring may be revealed by comparing the scored paper with the paraffin copy of the subject's original markings.

6. *Speed of Decision:* Downey, Ruch and Del Manzo, and Filter have speed of decision tests which show intercorrelations that are significant.

7. *The Questionnaire:* Cady subjected an adapted Woodworth questionnaire to critical statistical analysis. He "obtains reliabilities of +0.55 and +0.47. With such reliabilities, the questionnaire takes its place with the other tests which we have been discussing. The correlation of the questionnaire with the criterion of incorrigibility is +0.36."

8. *Tests of Judgment of Moral Traits:* Binet, Liao, Brogan, and Pressy have proposed moral judgment tests; but these have not been studied. Cady uses a word judgment test and finds a reliability of +0.86 for adults, but only +0.38 for children. The test correlates +0.30 with the criterion of incorrigibility and +0.34 with intelligence.

Three points of criticism of the movement to measure character are offered: (*a*) "Are we trying to measure something that actually exists? . . . . If we have found

that memory and imagination are particular, depending on the material with which they deal, so much the more snobbishness, vulgarity, or even honesty and trustworthiness." (*b*) Progress in character testing would be more rapid if effort were given to develop reliable tests that test accurately rather than to develop tests that are valid for a particular purpose. (*c*) Test less important, in the sense of less general, traits. Possible lines of development are scales for measurement of health, generalness of conduct habits, ability to study, and manners.

Information as a Measure of Intelligence and Maturity. WILLIAM R. WILSON. Journal of Educational Psychology, May, 1924, Vol. 15, No. 5, pp. 309–15.

The problem is to determine the accuracy of an information type of test in measuring intelligence. To determine the effect of experience and maturity on this type of test, the scores of two groups differing in these factors were studied. The Army Alpha test papers of 168 pupils in Grades IX to XII in the Grand Rapids (Minnesota) High School were used. A test paper of the same total score as each high school paper was selected from the Alpha test blanks given to students in the University of Washington.

"These results show that with the groups used there was no undue influence of age or experience upon score in the information test. In both groups the correlation of age with total score and with information is, in effect, zero."

A study of the scores made by high school pupils and by university students of different ages revealed that the ratio of the score in the information test to the total score remained substantially constant in each group. "The suspicion of these tests, based on common sense grounds, is unfounded in the case of tests given to high school and college students."

The Limitations of Scientific Method in Educational Guidance. DONALD G. PATERSON. Vocational Guidance Magazine, October, 1925, Vol. 4, No. 1, pp. 15–18.

This article considers the necessity for and presents methods pursued in educational guidance, with suggested lines of development. Pseudo-scientific methods of the type of phrenology are dogmatically condemned. The facts that will form the foundation for better educational guidance in colleges and universities are found in the answers to the questions:

(1) Will knowledge of a student's high school marks enable us to predict whether he will be successful in college, and hence enable us to advise him to enter college or to seek some other form of training or employment?

(2) Will knowledge of a student's intelligence test results aid us in predicting whether or not he will be successful in college?

In the judgment of the author, those students who rank high in both of these ratings should receive every encouragement. "If we could reduce the enrollment of those who can afford a college education but cannot profit by it, and at the same time increase the enrollment of those who can greatly profit from a college education but cannot afford it, we should have made a substantial contribution to a more satisfactory scheme of educational guidance."

Calls attention also to the urgent need of scientific methods of measuring motives, attitude, interests, and special abilities.

Notes on Rating. PERCIVAL M. SYMONDS. Journal of Applied Psychology, June, 1925, Vol. 9, No. 2, pp. 188–195.

Two teachers rated a class of pupils on a graphic rating scale in seven traits and a week later ranked them in these same traits. Two other teachers furnished similar data but did the ranking first. The reliability of estimation of a given trait was determined by correlating the results of two teachers The average reliability of all the traits by the rating method was 0.438 and by the ranking method 0.445. In other words the ranking and rating methods were equally reliable.

A modified rating chart is suggested comprising seven columns for each trait headed 4 per cent very low, 11 per cent bad, 21 per

cent poor, 28 per cent average, 21 per cent good, 11 per cent very good, 4 per cent excellent. The rater checks in one of these columns being guided by the percentages.

The size of the halo effect was determined statistically. A teacher's general impression of a pupil was found from the composite sum of her ratings in the seven traits. The correlations between the ratings of the two teachers for each trait were likewise obtained. Then partial correlation coefficients of the second order were found between the ratings made by two teachers on a given trait with the composites for each of the raters made constant. Such partial coefficients were computed for each of the seven traits. The average of these was 0.14 whereas the average of the original (zero order) coefficients was 0.39. In other words, the halo of general impression accounted for the drop of 0.24 points in the correlation. Similarly with estimates of seven different academic habits the drop was from 0.38 to 0.20.

News Notes

NEW MEMBERS OF PERSONNEL RESEARCH FEDERATION

Announcement is made of the election of Syracuse University, School of Citizenship and Public Affairs to corporate membership in Personnel Research Federation. The designated representative will be Dr. W. E. Mosher, Dean of the School, well known for his contributions in Federal personnel administration as well as for his industrial studies.

New York University, School of Commerce, Accounts and Finance will be represented in corporate membership in Personnel Research Federation by its newly appointed Dean, J. T. Madden.

PERSONNEL RESEARCH FEDERATION

Activities of Member Organizations

The variety and extent of current personnel studies is well illustrated in the following statements of corporate members of the Personnel Research Federation, prepared at the time of the recent annual business meeting. In this issue we present reports from the American Telephone and Telegraph Company, the Walworth Company, the United States Bureau of Labor Statistics, the University of Chicago School of Commerce and Administration, Carnegie Institute of Technology, Dartmouth College, and the Vocational Service for Juniors.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

The American Telephone and Telegraph Company, as reported by Col. R. I. Rees, recently completed for the use of its many employees and subsidiary companies two publications, one on the subject of health, and the other on thrift. Each is the result of a very careful investigation.

The General Health Course for Women of the Bell System is the outcome of over a year's intensive study in close coöperation with the American Red Cross and the American Medical Association, and the experiences in this field of all the organizations of the Bell System.

The Employees' Savings Plan of the American Telephone and Telegraph Company is a payroll deduct plan of saving, and together with the Stock Purchase Plan rounds out a complete scheme for saving for the employee. This plan will no doubt be used as a model for the development of saving plans throughout the Bell System.

The problem of developing a reliable method of predicting the need for and opportunities of college graduates within the Bell System is now being attacked.

WALWORTH COMPANY

Mr. Howard Coonley spoke briefly of the important part personnel research is taking in business and industrial concerns. He compared conditions in the Walworth Company of ten years ago with existing conditions, and attributed much of the increased efficiency to the adoption of methods which have been made possible by researches and analyses. To illustrate one important point in personnel, he called attention to a study made by Joseph H. Barber for the Walworth Company on "Economic Control of Inventory," recently published, in which Mr. Barber demonstrates how scientific control of production in relation to predicted demand has resulted in greatly increased stabilization of employment.

UNITED STATES BUREAU OF LABOR STATISTICS

Activities for the year ending October 1, 1925

Ethelbert Stewart, United States Commissioner of Labor Statistics presented the following report to the Personnel Research

Federation at its annual meeting in New York, October 16, 1925.

The most condensed form in which the work of the United States Bureau of Labor Statistics can be presented for the past year will be to submit a list of titles of reports either published, or sent to the printer for publication and not yet received, and investigations now in progress but not ready for publication. This would, however, have to be supplemented by what is being done through the publication of the Monthly Labor Review and also some idea of investigations being planned for the immediate future.

To understand intelligently a mere list of publications it is necessary to say a few words about the general lines of activity. For instance, collecting the material and compiling the wages and hours of labor in a large number of industries. These studies are made for each industry once in two years so that any annual list represents about one half the industries actually covered. These bulletins are designated simply as "wages and hours of labor" in the industry to which they pertain.

Frequently the Bureau will make a study of some particular phase of a subject connected with the industry in which case the information may or may not be more or less intimately connected with the question of wages.

The Bureau also prints, from time to time, safety codes for the various industries as compiled or approved by the American Engineering Standards Committee. In a list of the bulletins delivered within the year named, the first two come under the second classification, that is, Bulletin No. 356 is a study of the labor cost of production of 1000 brick in various plants throughout the United States. It covers the matter of equipment of the plant and deals with wages only as they must be dealt with in order to obtain productivity costs. In other words, efficiency is the objective point and wages more or less subordinate. The same observation is true with regard to labor conditions in the Fairmont West Virginia bituminous coal fields (Bulletin 361). It is a general study rather than a wages study. With this explanation the titles of the bulletins published and delivered during the year are submitted:

Number	*Title*
356.	Productivity costs in the common-brick industry.
361.	Labor conditions in the Fairmont (West Virginia) bituminous coal field.
362.	Wages and hours of labor in foundries and machine shops, 1923.
363.	Wages and hours of labor in lumber manufacturing, 1923.
364.	Safety code for mechanical power-transmission apparatus.
365.	Wages and hours of labor in the paper and pulp industry.
366.	Retail prices, 1913 to December, 1923.
367.	Wholesale prices, 1890 to 1923.
368.	Building permits in the principal cities of the United States in 1923.
370.	Labor laws of the United States, with decisions of courts relating thereto.
371.	Wages and hours of labor in cotton-goods manufacturing, 1924.
372.	Convict labor in 1923.
373.	Wages and hours of labor in the slaughtering and meat packing industry.
374.	Wages and hours of labor in the boot and shoe industry, 1907 to 1924.
375.	Safety code for laundry machinery and operations.
376.	Wages and hours of labor in the hosiery and underwear industry, 1907 to 1924.
377.	Wages and hours of labor in woolen and worsted goods manufacturing, 1924.
378.	Safety code for woodworking plants.
379.	Comparison of workmen's compensation laws of the United States.
380.	Postwar labor conditions in Germany.
381.	Wages and hours of labor in the iron and steel industry.
382.	Code of lighting school buildings.
383.	Works council movement in Germany.
384.	Labor conditions in the shoe industry.
385.	Eleventh annual meeting, International Association of Industrial Accident Boards and Commissions.

386. Cost of American almshouses.
387. Men's clothing industry, 1911 to 1924.
388. Union scale of wages and hours of labor, May 15, 1924.
389. Eleventh annual convention of Association of Governmental Labor Officials.
390. Wholesale prices, 1890 to 1924.
392. Hygiene of the printing trades.
395. Index to proceedings of the International Association of Industrial Accident Boards and Commissions.
400. Proceedings of the twelfth annual meeting of the International Association of Public Employment Services.

Bulletin No. 384, "Labor conditions in the shoe industry," is practically confined to the situation in New England and refers more especially to Lynn where undue emphasis on fancy styles sold by special order before manufactured and before a labor cost price or any other cost price had been determined wrought havoc to a number of establishments.

Bulletin No. 386, "Cost of American almshouses," is another of the special reports.

Bulletins in process of printing

Number	*Title*
369.	The use of the cost of living figures in wage adjustments.
391.	Decisions of courts affecting labor.
393.	Trade agreements, 1923 and 1924.
394.	Wages and hours of labor in metalliferous mines.
396.	Retail prices, 1890 to December, 1924.
397.	Building permits in principal cities in the United States.
398.	Growth of legal aid work in the United States.
399.	Labor relations in the lace and lace curtain industry in the United States.
401.	Family allowances.

Investigations under way

1. Wages and hours in lumber manufacture.
2. Union scale of wages.
3. Wages and hours in foundry and machine shops.
4. Wages and hours in anthracite mining.
5. Wages and hours in bituminous mining.
6. Wages and hours in pottery industry.
7. Wages and hours in boxboard industry.
8. Occupational diseases in fireworks manufacture.
9. Occupational diseases in luminous watch dials.
10. Retail prices, 1925.
11. Wholesale prices, 1925.
12. Trade union hand-book.
13. Old age and disability pensions.
14. Continuation of the study of hygiene in the printing trades.
15. Further study of lead poisoning.

Contemplated investigations: General

1. Wages and hours in slaughtering and meat packing.
2. Wages and hours in automobile manufacture.
3. Wages and hours in iron and steel.
4. Wages and hours in boots and shoes.
5. Wages and hours in cotton goods manufacture.
6. Wages and hours in woolen goods manufacture.
7. Wages and hours in hosiery and underwear manufacture.
8. Wages and hours in clothing goods.
9. Union scales of wages.
10. Construction of public highways by convict labor.
11. Wages of common laborers.
12. Outdoor recreation and welfare for industrial employees.

Special studies contemplated

1. Efficiency of labor in textile manufacture.
2. Efficiency of labor in iron and steel.
3. Efficiency of labor in pottery manufacture.
4. Trade union movement in Brazil.
5. Trade union movement in Mexico.
6. Trade union movement in Japan.

Monthly Labor Review

The Monthly Labor Review covers such available information as can be gathered

from the outside, and a summary of what is being done in the Bureau each month on the following topics:

1. Prices and cost of living.
2. Wages and hours of labor.
3. Productivity and efficiency of labor.
4. Minimum wage.
5. Labor agreements, awards and decisions.
6. Woman and child labor.
7. Employment and unemployment.
8. Industrial relations and labor conditions.
9. Industrial accidents and hygiene.
10. Workmen's compensation and social insurance.
11. Labor laws and court decisions.
12. Housing.
13. Coöperation.
14. Workers' education and training.
15. Profit sharing.
16. Rehabilitation.
17. Labor organizations.
18. Strikes and lockouts.
19. Conciliation and arbitration.
20. Immigration.
21. Factory inspection.
22. Standardization.
23. What state labor bureaus are doing.
24. Current notes of interest to labor.

In addition there are usually from one to three special articles in each issue. These consist of complete reports of special investigations by the Bureau of Labor Statistics which are not bulky enough to warrant their publication in a bulletin, or articles of industrial importance secured from competent investigators outside the Bureau. The special articles published during the year indicated are as follows:

October:
- (a) Workers, machinery and production in the automobile industry.
- (b) Present status of old age pension legislation in the United States.

November:
- (a) Labor productivity and costs in certain building trades.
- (b) Development and operation of pilots associations at representative ports.
- (c) Labor conditions in China.

December:
- (a) Value of accurate statistics in accident work.

January:
- (a) Apprenticeship in the building trades in Washington, D. C.
- (b) Health of the workers.

March:
- (a) Accident prevention plans of the Illinois Department of Labor.
- (b) German Metal Workers' Federation study of the German automobile industry.

April:
- (a) Trend of employment of men and women in specified industries.
- (b) Labor recommendations in Governor's messages, 1925.

May:
- (a) Efficiency and wages in the United States.
- (b) Coal situation in Illinois.
- (c) Trend of occupations in the population.

June:
- (a) The industrial round table for conciliation in labor disputes.
- (b) A new experiment in education for workers.

July:
- (a) Economics of creamery butter consumption.
- (b) Industrial ventilation as applied to harmful dusts, gases and fumes.

August:
- (a) Most important factor for safety work in the plant.
- (b) New hazards of industry.

September:
- (a) Trade union movement and wages in Brazil.

THE UNIVERSITY OF CHICAGO SCHOOL OF COMMERCE AND ADMINISTRATION

A note concerning personnel activities

Dean W. H. Spencer prepared the following admirable formulation of policies in student personnel work.

"We are becoming more and more firmly convinced that in the field of student personnel, specific devices and bits of technique are less important than a pervas-

ive personnel spirit and appreciation of personnel objectives on the part of administrative officers, teaching staff, and student body. It seems to us that student personnel work is nothing less than an attempt to improve our whole educational process by placing more emphasis on the rounded development and intellectual arousal of the individual student and on his successful adjustment to present work and to future vocational and non-vocational activities. We hope, accordingly, to have our work for the present consist primarily of procedures for encouraging throughout our organization some careful thinking about personnel aims and problems. A questionnaire is being prepared, to be answered by faculty and students, which will deal with a number of issues in relation to teaching aims and methods, student activities, vocational training, etc. A series of informal discussion meetings of the faculty and representatives of the student organization will be held to thresh over these matters and to take action when that appears desirable.

"In addition to this very general plan, we expect to continue the specific personnel procedures worked out during the past few years. These include the keeping of detailed personal records (personal history and application form, high school record, reference reports, psychological test scores, rating scale estimates of personal qualities, photograph, record of current work and outside activities); the sectioning of classes according to ability; the holding of interviews with all entering freshmen and with a certain number of advanced students; the provision of vocational information through special talks and by means of a selected shelf of vocational books as well as through ordinary course instruction and field-work requirements; and finally, the carrying on of special research studies on tests, rating scales, reference reports, grades, methods of study, etc., with a view to improvements in these matters."

CARNEGIE INSTITUTE OF TECHNOLOGY

The status of research work on personnel problems being conducted by the Department of Education and Psychology may be indicated by the following statement of reports, publications and material ready for publication.

Material in published form

Department of Education and Psychology: *Report on Thorndike Intelligence Tests.* December, 1924. (This report will be extended to include new data made available by studies carried out during the past year. The amplified report will be available December, 1925.)

Cleeton, Glen U. *Meeting the Need for Improved Measures to be Used in the College Guidance Program.* Journal of Educational Administration. October–November, 1925.

Ruch, G. M., Glen U. Cleeton and G. D. Stoddard. *Iowa High School Content Examination.* Published by the University of Iowa.

Cleeton, Glen U. *Analogies Test in "Psychological Examination for High School Graduates and College Freshmen."* Published by the American Council on Education, Washington, D. C.

Ready for Publication

Cleeton, Glen U. *The Predictive Value of Certain Measures of Ability in College Freshmen.*

Cleeton, Glen U. *Intelligence Tests in Theory and Practice.*

Studies in Progress

Relation between measures of ability and measures of success in general.

Relation between measures of ability and success in specific courses.

Relation between measures of ability and choice of courses.

Improvement of measures of ability.

Bureau of Recommendations

Mr. G. L. Tilbrook reports for the Bureau of Recommendations that during the year 1924–25 about sixty representatives of various industries and educational institutions came to interview the graduating class. Besides permanent placement for the graduating students, the Bureau is active in securing part-time work for day

and night students, as well as acting as a clearing house for alumni.

The following is the result of a survey covering a period of five years:

More than 200 men and about 100 women day students annually are helped to earn enough to make their education possible.
500 men and 200 women day students annually secure work through the bureau.
200 men and 75 women graduates are placed in better positions annually.
100 men are given positions which enable them to attend night school.
150 men and women are placed in positions during the summer months.

Complete employment and personal history files of graduates and former students are maintained.

DARTMOUTH COLLEGE

Bureau of Personnel Research

The past year has been a period of reorganization in the Bureau of Personnel Research at Dartmouth College. Little has been attempted during this time in the way of research although certain of the active operations have been continued. Plans for the work are now completed, however, and a definite program is being undertaken.

A committee of eight or ten members, including certain officers of the Administration and members of the academic faculty, are in charge of all personnel work. Professor H. R. Wellman is chairman and active head of the committee.

Offices of the various branches of personnel work are now grouped in one building. The distinct functional divisions are as follows: intelligence testing; educational and vocational advice; placement; records and research; malnutrition and mental hygiene.

The Psychology Department is in charge of all intelligence testing. Every freshman is given a psychological examination shortly after the opening of college. The results of this examination are used indirectly in giving the men informal educational advice during subsequent interviews. It is intended that every freshman be interviewed during his first year by a member of the committee. No vocational advice is given, however, prior to the junior year. Later in the student's course some advice may be given as a part of the placement work carried on with the men, both for those desiring summer employment and for those seeking permanent positions.

Records and research are in charge of a research assistant. A complete undergraduate record of every student is kept with the material furnished by the various college offices. An important feature, distinctive of the new program, is that a thorough medical examination is given every entering student and this record filed together with a complete previous history.

Dr. M. A. Harrington, a resident, full-time psychiatrist, deals with all matters of mental hygiene. Advice and assistance are available to any student who finds himself unable to make proper adjustments to his environment in order to accomplish the best results from his college work.

On the basis of the medical examination, classes in malnutrition are formed for the purpose of building up the men through proper diet, exercise and sleep. Dr. W. R. P. Emerson instituted this work during the year 1924–25 and it is continuing with marked success under his direction. An article in the Dartmouth Alumni Magazine (February 1924, Vol. 17, No. 4) presented a statement of the problem of physical fitness with reference to causes, extent and methods of identifying the unfit and the program worked out for bringing them up to normal condition. A report of progress appearing in the May issue of the same magazine (Vol. 17, No. 7) gave the results of a study concerning the relation of malnutrition and fatigue with academic work and extra-curricular activities. By means of charts and tables, Dr. Emerson shows the effects of overwork, malnutrition and lack of sleep as related to academic schedules, vacation periods and examinations. Reprints of this article may be secured from the Nutrition Clinics, 44 Dwight Street, Boston, Mass.

VOCATIONAL SERVICE FOR JUNIORS

In December, 1924, a report was submitted to the City Board of Education detailing the work of our organization and outlining a plan and budget for the incorporation of guidance and placement work in the school system. The plan suggested called for the establishment of counselors in each of the 46 junior high schools and placement offices in each of the 6 continuation schools. The total budget was estimated at $109,800.

Following conferences with various members of the School Board and Board of Superintendents a restricted program was submitted to the Board of Superintendents calling for 6 counselors in junior high schools and 2 counselors in a Continuation School. The budget suggested was $15,200. This matter was referred to a committee of the Board of Superintendents. A very favorable report by this committee was unanimously accepted by the Board of Superintendents in June, 1925. In July this report was acted upon by the Budget Committee of the Board of Education and refused an appropriation. At the last meeting of the Board of Education, however, it was passed over the Budget Committee refusal and "an appropriation of $15,000 for the salaries of persons engaged in vocational guidance work" was included in the school budget. The city budgets are now before the Board of Estimate and Apportionment and our item has survived through the stage of the tentative budget. The Board of Estimate submits its final budget October 31st. [The item for vocational guidance was approved.—Ed.]

In addition to our regular activities along the lines of school counseling, placement, and high school scholarship, we have compiled a directory of approximately 250 free and commercial schools in Greater New York for vocational training of all sorts. In tabular form is stated the subjects taught, entrance requirements, tuition, length of course, etc. It is cross indexed by subjects taught. All schools were personally investigated by the Vocational Service for Juniors and only approved institutions were listed.

Research completed and in press

A comparative study of the Difference in Mental Capacity of Jewish and Italian children—Seago-Koldin.

Groups of Jewish (800) and Italian (452) children of 6 B grade were given the National Intelligence test. A significant difference in favor of Jewish group was shown in the total score.

When age and sex were made constant the group of Jewish boys (250) again showed a significant superiority over the Italian boys (143). When the total score of this group is analyzed by individual tests there is a significant difference in favor of the Jewish group in those tests involving the use and comprehension of language and abstract verbal reasoning and this difference is less marked in tests involving concrete, non-verbal functions.

When, however, the group is further refined by making not only school grade, sex and age constant but by taking 100 cases of equal total scores the difference between the standing in the two types of individual tests is so small as to be insignificant.

Research in progress

1. A Follow-up study of the Industrial Careers of individuals who were carried on scholarship by our organization during part or all of their high school course. We are interested primarily in knowing: (a) how many sought further education or training, (b) how many are now employed in the line of work for which they were given specific training, (c) how far they may be considered successful at this stage of their industrial career, and in relating these to the factors which determined our choice in granting the scholarship.

2. A study of the value of vocational guidance in the public evening schools.

DIRECTORY OF OPPORTUNITIES FOR VOCATIONAL TRAINING IN NEW YORK CITY

The following editorial on the work of one of our member organizations is quoted from *The New York Times*, October 8, 1925.

"A valuable directory"

"There has just been published by The Vocational Service for Juniors a Directory of Opportunities for Vocational Training in New York City, principally for children over 14 years of age, but including information concerning courses in colleges, since children looking forward to professional work need such information in making their plans. There is, first of all, a schedule of all schools giving such opportunities, the studies offered by them, the admission requirements, length of course and time of session, day or night, together with fees, scholarships and prizes. Following upon this is an index of schools by subject. If one wishes to learn oxyacetylene welding, for example, one finds in this index that there are three schools in which instruction in this subject can be had. There are nineteen places which provide training for nursing, eight for the teaching of trades to the handicapped, and no less than seventy for instruction in 'typing.' Among the several hundred subjects included are these taken at random: Agriculture, automobile mechanics, 'beauty culture,' candy-making, dancing, switchboard operating, library training, home economics, blacksmithing, and applied design in furniture, fur, garments, jewelry, lace, stained glass and other materials.

"It is a most useful service that this private organization has undertaken for the public. Not only has it published this directory (a paper-bound book of nearly 200 pages), the first edition of which was put forth in 1922. It also performs three other functions: first, it maintains counselors in a limited number of junior high schools to give vocational information and advice to pupils, and it gives the service of one especially qualified to talk to schools as to occupations and opportunities; second, it awards scholarships (of from $150 to $300) to enable ambitious and capable children to attend a high school or trade school; and, third, it conducts free employment bureaus in Manhattan where children under 18 may be placed in jobs that have been investigated. For the first of these assistance has now been asked, through the Board of Education of the city, in order that this service to pupils may help them to select a vocation and then to prepare for it. A small sum for this purpose is in this year's budget. This organization, which has been doing its work voluntarily for several years, deserves not only continued private support but public recognition. The directory which it publishes should be within the reach of parents and teachers generally, so that they may not only let the children and youth know what vocations are open to them, but may set their feet upon the paths that lead to these goals. The address of this organization, The Vocational Service for Juniors, is 122 East Twenty-fifth Street."

PSYCHIATRIST GOES TO YALE

Dr. Arthur H. Ruggles has obtained leave of absence as director of the Butler Hospital of Providence, R. I., and accepted an appointment at Yale as consultant in mental hygiene to the Department of University Health, and lecturer in psychiatry in the School of Medicine. The University has also nominated Dr. Ruggles to the Board of Directors of the New Haven Hospital as psychiatrist to the hospital and dispensary. The Department of University Health has charge of the physical welfare of the students.

It is anticipated that Dr. Ruggles will establish an active connection with the Connecticut State Mental Hygiene Association, which maintains mental hygiene clinics throughout the State.

In commenting upon the selection of Dr. Ruggles President James R. Angell said. "With this appointment Yale begins the development of a highly important contribution to medical education, to the welfare of the student body and to the hygiene interests of New Haven and neighboring communities."

STUDENT PERSONNEL AT OBERLIN COLLEGE

The Department of Psychology at Oberlin College is increasing its facilities for research in the field of student personnel. Dr. L. D. Hartson will continue to give half of his time to this work and in addition, Mr. Paul V. Means has been added to the

department with the rank of Assistant Professor. His time will be devoted entirely to personnel research and to interviews with students.

PERSONNEL DIRECTOR AT SMITH COLLEGE

Smith College has appointed a Personnel Director, Dr. Mabelle B. Blake. Dr. Blake, in coöperation with other departments—administrative, academic and student—will help to coördinate data pertaining to the training, mental capacity, academic standing, physical equipment and aptitudes of the students. The college has already accomplished much for individuals through the work of Class Deans and other officials, but it is hoped that the Personnel Director will aid in obtaining a scientific understanding of personal problems and will help the students in adapting themselves to present educational needs and in making a choice of future occupations. The definite program must necessarily develop slowly; it can be determined only after study and experience show the greatest need.

COLORADO FUEL AND IRON COÖPERATIVE EDUCATIONAL INSTITUTE

Dr. Arthur F. Payne, of New York City, spent six weeks at Pueblo, Colorado, during the fall making a survey of all educational activities, to propose a coördinating plan, and to initiate a comprehensive educational program covering all phases of education for all groups of employees of the Colorado Fuel and Iron Company.

In an introductory statement Dr. Payne outlined four new elements in the proposed plan:

1. Education for citizenship, education for power, and education for leisure.

2. Owing to the great variation in the previous education of foremen, it is proposed to group the foremen by analysis and self-selection into *definite case groups*. This case grouping to be done on the basis of one or more elements, such as previous education or training, which are common to all members of the group.

3. The arrangement of short specific intensive units of instruction to meet the needs of these selected case groups. The idea being to offer these intensive units of instruction, allowing the foremen and other employees free choice as regards which course they desire to take, and in that way organize themselves into case groups. A list of nearly 50 unit courses have already been specified as possibilities during the coming winter. On October 15th thirty of these unit courses were in actual operation.

4. The use of coöperating agencies. Arrangements have already been made for definite units of instruction to be offered in coöperation with the public schools, particularly in the evening high school and evening vocational school; others will be offered in coöperation with the State Department of Education; University Extension Division of the Colorado College at Boulder; the Y. M. C. A., and other similar educational agencies.

The following courses are already in operation:

1. Safety and Sanitation
2. Problems in Employment Management
3. Power Plant Engineering
4. Psychology of the Worker
5. Kinematics
6. Mechanics
7. Strength of Materials
8. Machine Design
9. Methods of Handling Labor
10. Gas Producing
11. Steam Engineering
12. Industrial Chemistry
13. Lubrication
14. Mechanical Drawing
15. Blue Print Reading
16. English for Foreigners
17. Machine Shop Practice
18. Carpentry
19. Oxy-acetylene Welding
20. Mill-Work
21. Practical Electricity
22. Practical Mathematics
23. Business English
24. Advanced English
25. Bookkeeping
26. Salesmanship
27. Millinery
28. Dressmaking
29. Spanish
30. Trigonometry
31. Applied Algebra
32. Job Analysis

For all of these courses a registration fee of $1.00 is charged, the C. F. & I. making good any deficit. This arrangement is open to all employees of the C. F. & I. in the steel plant, coal mines, iron mines, quarries, railroads, offices and stores. It includes not only employees but their wives and dependent daughters.

RECENT MEETINGS AND CONFERENCES

Several meetings, listed below, were held within the past few weeks at which matters of importance pertaining to personnel were discussed.

Owing to the necessity of going to print before reports of these meetings could be prepared, readers are urged to consult the publications of the organizations concerned.

The Ninth Annual Industrial Safety Congress, and exhibit of the New York State Department of Labor, was held November 30 and December 1, 2 and 3 in Syracuse.

American Management Association (Production Executives' Division) Conference on Employee Representation was held November 30 and December 1, at Kansas City, Mo. This is the second of a series of conferences on this important subject. The present status of employee representation in America, chief problems involved in introducing a plan of employee representation, philosophy of employee representation, and other phases of the question were presented.

The Taylor Society held its annual meeting at the Engineering Societies Building, 29 West Thirty-ninth Street, New York, December 2 to 5, 1925. Special sessions were held for Teachers of Management. In a joint session with American Society of Mechanical Engineers Management Division, production control, industrial hygiene, and industrial psychology were the topics. Other sessions were devoted to the relation of major executives to the departmental executives, coöperation between organized labor and management, sales methods, etc.

A meeting of the American Psychological Association was held December 28 to 30, at Goodwin Smith Hall, Cornell University, Ithaca, New York.

American Association for the Advancement of Science, *Section I Psychology* held its annual meeting at Kansas City December 29 to January 1, 1926. The retiring president, Dr. J. McKeen Cattell spoke on "Some Psychological Experiments." One session was devoted to the technique of testing.

Other meetings of interest that occurred December 28–31 in New York City were: American Political Science Association, American Sociological Association, American Economic Association, American Statistical Association, American Association for Labor Legislation, American Community Center Association.

FORTHCOMING MEETINGS AND CONFERENCES IN WASHINGTON

The National Vocational Guidance Association will meet at the Hotel Washington, Washington, D. C., February 18 to 20.

The Department of Superintendence of the National Education Association and the various societies which meet at the same time, including the Deans and Advisers of Women, will be in session during the week of February 22.

At a special session of the National Association of Appointment Secretaries, the following papers will be presented:

Report of the Research Studies Which Have Been Made in the Field of Appointment. Robert K. Speer.

Research in Vocational Guidance Through the Bureau of Appointments. Harry D. Kitson.

What American College Placement Services are Doing. W. V. Bingham.

The Placement Problem as an Aspect of Educational Personnel Administration. Ben D. Wood.

ASSOCIATION OF AMERICAN COLLEGES, TWELFTH ANNUAL MEETING

The Association of American Colleges will hold its twelfth annual meeting at the Hotel Astor, New York, January 14 to 16, 1926. The subject of the entire meeting will be "The Effective College."

Dr. Adam Leroy Jones of Columbia will present the report of the Committee on College Personnel Technique. This report is the result of a census of some three hundred colleges regarding their practice in the matter of special examinations for freshmen and freshman placement.